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CURRENT SERIAL RECORDS

3  
**MULTIPLE  
LINT  
CLEANING  
at  
COTTON GINS**

**Effects on Bale Value, Fiber Properties,  
and Spinning Performance** 432

42  
Marketing Research Report No. 601

56  
Economic Research Service  
Agricultural Research Service  
Agricultural Marketing Service  
U.S. DEPARTMENT OF AGRICULTURE

## PREFACE

This study of the effects of the use of lint cleaners at cotton gins on market value, fiber properties and spinning performance of fibers is one of a series conducted by the Department of Agriculture during the past decade. The study was developed jointly by Economic Research Service, Agricultural Marketing Service, and Agricultural Research Service in cooperation with the National Cotton Council, gin machinery manufacturers, ginners, and producers.

Results of related studies are given in the following reports:

Effects of Cotton Ginning Practices on Market Quality of Cotton--A Mississippi Delta Variety, 1958-59. Mktg. Res. Rpt. 576. January 1963

Cotton Fiber and Spinning Properties as Affected by Certain Ginning Practices in San Joaquin Valley, California, Season 1958-59. Mktg. Res. Rpt. 486. July 1961.

Seed Cotton and Multiple Lint Cleanings at Gins--Effect on Grade, Price, and Bale Value (A Progress Report). ERS-43. December 1961.

Effects of Tandem Lint Cleaning on Bale Values, Weight Changes, and Prices Received by Farmers. Mktg. Res. Rpt. 397. May 1960.

Effects of Cleaning Practices at Gins on Fiber Properties and Mill Performance of Cotton (A Progress Report). Mktg. Res. Rpt. 269. August 1958.

Effects of Lint Cleaning of Cotton--An Economic Analysis at California Gins. Mktg. Res. Rpt. 238. May 1958.

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May 1963



## SUMMARY

Effects of multiple lint cleaning on bale values, fiber properties, and spinning performance of cotton were studied at two gins in each of three major producing areas during 1961-62. The first phase of the study, designed to determine the effect of lint cleaning on returns to growers, included 1,800 bales from which samples were drawn before any lint cleaning and after each of three stages of cleaning. Material removed at each stage was measured and used as a basis for estimating changes in bale weights. Bale values were calculated by applying central market prices for the appropriate grade and staple length to the bale weights. The second phase, designed to determine the effect of lint cleaning on fiber properties, processing performance, and product quality, included 48 lots ginned at the same gins and using the same cleaning stages.

Each additional stage of lint cleaning generally reduced bale weights and improved grades, but had little effect on staple length. Weight losses per bale from three stages of lint cleaning in the Midsouth area ranged from about 15 pounds for Middling White cotton to about 30 pounds for Below Grade cotton. At the other extreme, losses in California ranged from about 18 pounds for Middling White to about 55 pounds for Good Ordinary. Over half of the total reduction in bale weight in all areas occurred at the first stage of cleaning. Grade improvements were registered at each stage of cleaning in all areas, with over 70 percent of all bales improved by the first stage; about 95 percent by two stages; and nearly all bales by three stages. A slight, but statistically significant, increase in classer's designation of staple length occurred with the addition of the first lint cleaner in all areas. Subsequent additions of lint cleaners had no discernible effect.

After allowing for the differences in bale weight, and with the narrow market price differentials for grade prevailing in 1961, bale values of cotton grading Middling White before lint cleaning remained about constant or tended downward with each successive addition of lint cleaners in all areas. Generally, bale values of Strict Low Middling or lower White grades were increased with the use of the first lint cleaner, but with the exception of the Midsouth were little changed by use of additional lint cleaners. Cotton graded as Middling or lower Light Spotted or Spotted before lint cleaning was usually increased in bale value by the use of one lint cleaner and, in many instances, further increased by the use of two or even three lint cleaners. Gains from lint cleaning would have been much more marked if price differentials had been wider, as they were in 1957-58.

Cost to gins for the first stage of lint cleaning was estimated at approximately 43 cents per bale for single-stream cleaning and 68 cents per bale for split-stream cleaning, with an average rate of ginning of 6 bales per hour and an annual volume of 6,000 bales. Cost for three stages of single-stream cleaning under these conditions was \$1.24 per bale in the Midsouth and \$1.21 per bale in Texas. No estimates were made for single-stream lint cleaning in California. Cost for three stages of split-stream cleaning at a ginning rate of 6 bales per hour and 6,000 bales annual volume was \$2.04 per bale in the Midsouth and \$1.96 per bale in Texas and California. Costs would decline moderately with increases in volume above 6,000 bales, but would rise sharply with decline in volume below that level.

Foreign matter in the ginned lint was reduced significantly with each successive stage of cleaning. The greatest reduction occurred at the first stage of lint cleaning, about half as much at the second stage, and only a negligible amount at the third. Length uniformity, percentage of short fibers, and neps in card web were adversely affected by the use of lint cleaners.

Although appearance of yarns made from lots not subjected to lint cleaning averaged higher than that of yarns made from cottons passed through lint cleaners, the differences were neither consistent nor statistically significant. The break factor of yarns made from cotton from the Midsouth and Texas areas trended downward as lint cleaners were added. The break factor of yarns made from California cotton had no discernible or significant trend, although the highest break factor was obtained from cotton subjected to one lint cleaner. The overall averages of ends-down indicate that an increase could normally be expected as a result of three lint cleanings. However, the discrepancies in the data and the fact that these effects were not statistically significant indicate that other factors affecting spinning performance were not controlled or measured.



MULTIPLE LINT CLEANING AT COTTON GINS;  
Effects on Bale Value, Fiber  
Properties, and Spinning Performance

by Zolon M. Looney, L. D. LaPlue, Charles A. Wilmot,  
Walter E. Chapman, Jr., and Franklin E. Newton 1/

INTRODUCTION

During the last 15 years, the practice of lint cleaning at cotton gins has grown rapidly. In 1948, only 30 gins out of approximately 7,000 then operating had lint cleaning equipment. By 1961, an estimated 5,000 gins were cleaning lint. As early as 1955, a few gins had installed lint cleaners in series, and by 1961, nearly half of the gins with lint cleaners had two stages of lint cleaning and 9 percent had three stages.

The demand from cotton growers for lint cleaning stems directly from the increasing mechanization of cotton harvesting and from their interest in increasing gross returns from their cotton. Compared with hand picking, mechanical harvesting greatly increases the trash content of cotton and alters the nature of the trash. These conditions place a greater burden on gins to put out a high-quality bale of cotton that will bring the highest possible return to the growers. Lint cleaning tends to improve the grade of the cotton, and, therefore, may increase grower's returns more than enough to offset the added costs to ginners and growers.

Nevertheless, as the practice of lint cleaning, and particularly multiple lint cleaning, became more common, growers, ginners, manufacturers, and others have expressed serious doubts about its effects on the quality of cotton and about the economic soundness of it. Growers and ginners have raised questions about the effects of lint cleaning on returns to growers and on ginning costs. Manufacturers have expressed doubts about the effects of lint cleaning on the fiber properties of cotton, on the spinning performance of cleaned cotton, and on the quality of yarns made from such cotton. Claims have been made that lint cleaning so seriously damages cotton fibers that it increases manufacturing costs, reduces the quality of textile products, and reduces the competitive position of cotton in relation to other fibers.

Because of the serious nature of these questions in terms of the long-run interest of all segments of the cotton and textile industry, the U. S.

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Department of Agriculture undertook this study in 1961. The primary purpose of the study is to evaluate the technical and economic effects of varying stages of lint cleaning on such factors as grade, staple length, bale weights, bale values (returns to growers), costs of ginning, fiber properties, spinning performance, and strength and appearance of cotton yarns.

## REVIEW OF RELATED RESEARCH

Numerous studies have been conducted to determine the effects of ginning practices on grade and staple of cotton, fiber properties and spinning performance, and bale value to growers.

Results of studies in commercial gins to determine the effect of lint cleaning on bale values have been somewhat contradictory when only one lint cleaner was used. After a study conducted in several gins in California in 1954 and 1955, the authors concluded:

Routine use of any of the four types of lint cleaners studied resulted, on the average for all bales, in reductions in average bale value when weight losses from lint cleaning were taken into account (12). 2/

Another study conducted in Northeast Arkansas during the same seasons showed about the same results (2). However, in both reports it was pointed out that the differences in price between grades were extremely small at the time.

As a result of a study (6) conducted in the Arkansas Delta in 1957 and 1958 in gins equipped with two stages of lint cleaning, it was concluded:

When premiums and discounts for grades are at minimum levels, the use of only one lint cleaner causes a reduction in net bale value for some grades, with very little increase for the remainder. Use of tandem lint cleaning under similar market conditions may be expected to result in some increase in net bale value for all grades of Light Spotted and Spotted cotton, but only a few small gains and some losses for White cotton.

When premiums and discounts are near maximum levels, greater benefits may be expected from both one and two lint cleaners. Even under these conditions, however, losses in bale value may be expected from lint cleaning cotton grading Strict Middling White before such cleaning, and very little increase in bale value may be expected from cleaning Middling White cotton.

A study of limited range, conducted during the 1960 season at two gins in Arkansas and Mississippi, indicated that with up to two stages of lint

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2/ Underscored figures in parenthesis refer to items in the Selected References, page 37.

cleaning, improved grades could be expected from an elaborate overhead cleaning and drying setup. However, with three lint cleanings, equal results were obtained with moderate overhead cleaning. Bale weights were also affected by the seed cotton cleaning and drying treatments as well as the lint cleaners. Bale values were increased only moderately with one lint cleaning, but substantially with two. Use of the third lint cleaner resulted in further bale value increases. Use of a fourth lint cleaner in one of these gins indicated that no further bale value increase could be expected after three lint cleanings and a loss would likely be incurred (7).

Generally, the controlled tests have included extreme conditions of drying and seed cotton machining in combination with various stages of lint cleaning. One of the more elaborate of these tests was the so-called "17 mill test" carried out in 1951. Six gins in two major areas of production were involved. The variables investigated were: method of harvest; rate of ginning; overhead cleaning; lint cleaning; and drier temperatures. In the summary of the report of this study, the following reference to the effect of lint cleaners was made:

When the lint cleaners were by-passed, there was a slight reduction in grade index and an increase in mill waste and in trash in card webs. The number of neps in raw cotton was not affected, although there was a decrease in neps in the mill-made web and in the dyed cloth (9).

No mention was made of any change in ends-down (breakage of yarn during spinning).

In another test conducted in a California gin in 1957, two overhead setups (moderate and elaborate), in combination with two drier temperatures (high and low), and three lint cleaning conditions (none, one, and two) were compared. The cotton was spun in a commercial mill under strict supervision. The test showed conclusively that fiber properties and spinning performance were affected adversely by extreme drying conditions. The second lint cleaning slightly increased ends-down when the cotton was ginned with high moisture content and spun into 40s yarn (14).

Because the studies were somewhat limited in scope and because gin machinery in general, and lint cleaners in particular, are continually being improved, it was felt that a more extensive investigation of the effects of lint cleaners would be advisable.

#### METHOD AND SCOPE OF STUDY

This study was conducted, in cooperation with the National Cotton Council, gin machinery manufacturers, and six cooperating ginners, by the following agencies of the U. S. Department of Agriculture: the Cotton Ginning Research Laboratories of the Agricultural Research Service at Mesilla Park, N. Mex., and Stoneville, Miss.; the Market Quality Research Division of the Agricultural Marketing Service; and the Marketing Economics Division of the Economic Research Service.



Six gins, each with three saw-cylinder lint cleaners in series, were selected for the study. Two gins were in the Delta area of the Midsouth, two were in the Texas High Plains, and two were in California's San Joaquin Valley. Cyclone collectors were installed by gin machinery manufacturers at each gin, so that the waste from each lint cleaner stage could be collected and weighed separately for the bales sampled. The seed cotton cleaning and drying setups in the selected gins are shown in figure 1.

To determine the effects of lint cleaners on bale values, 100 bales were sampled at each gin at each of three visits, a total of 1,800 bales. Four lint samples were obtained from each bale, one before lint cleaning and one after each of the three stages of lint cleaning. A large number of samples was necessary to provide reliable and useful results. Samples were classed by official classers of the Cotton Division, Agricultural Marketing Service.

Waste from each stage of lint cleaning was collected and weighed for every bale. These bales were weighed after three lint cleanings and waste figures were adjusted to 500 pounds. Individual bale weights for two, one, and no lint cleanings were obtained by adding the adjusted waste figures to 500 pounds.

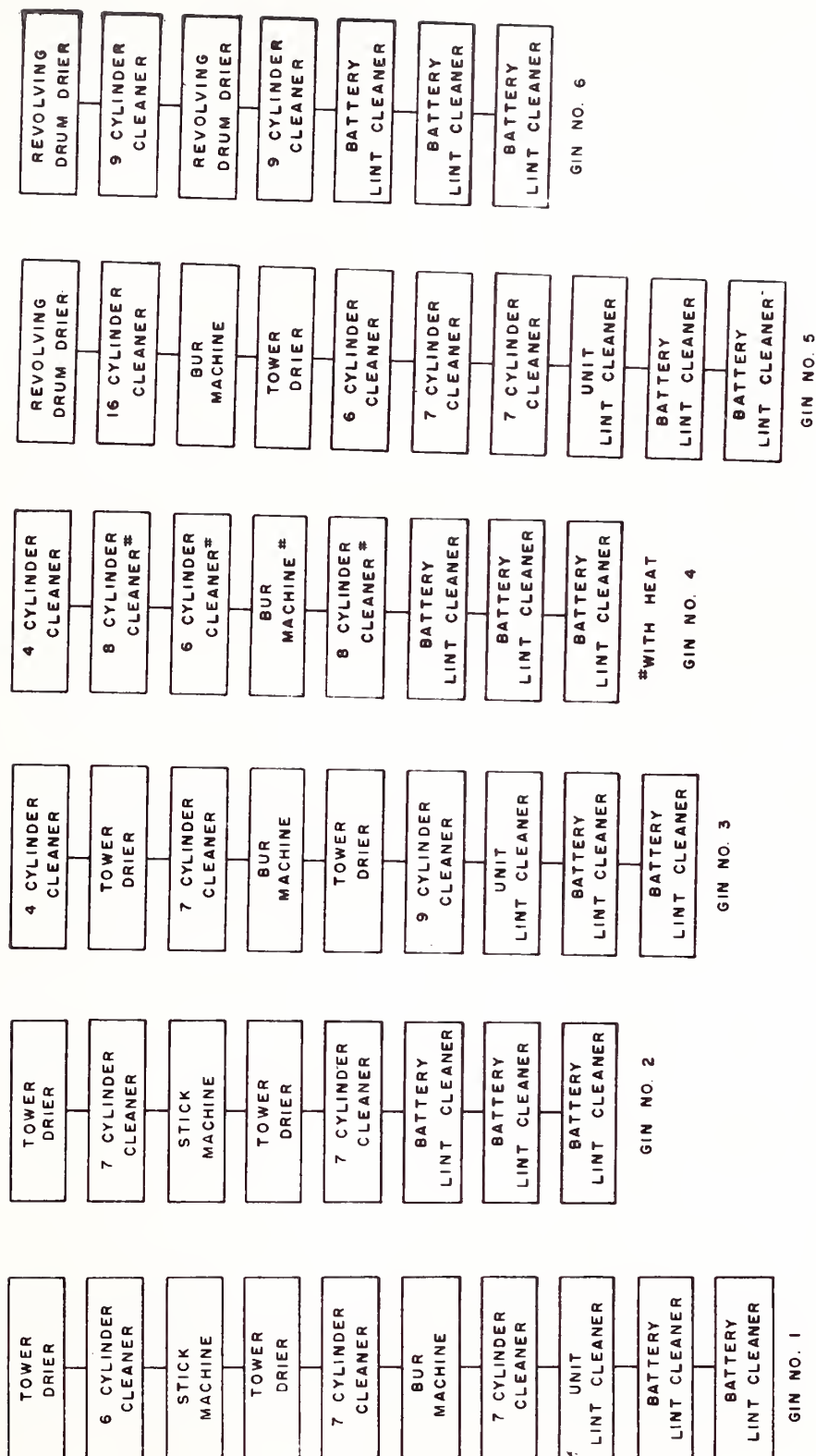
The bale value at each stage of lint cleaning was calculated by applying central market prices for the indicated grade and staple to the adjusted bale weight. To indicate the effects of varying price situations on differences in bale values resulting from lint cleaning, two sets of prices were used. One set was the average prices for the 14 designated spot markets for 1957, when price differentials between grades were extremely wide. The second set was the 14-market average for November 1961, when grade differentials were narrow.

The spinning lots represented two harvests of four bales each from each gin, providing a total of 48 spinning lots. Of the four bales, one each was ginned with no lint cleaning, one, two, and three lint cleanings. Wagon and feeder samples were obtained for foreign matter and moisture determination (appendix table 33). <sup>3/</sup> Samples of ginned lint were taken from each bale for classification and Shirley Analyzer tests. Standard fiber tests made for each lot included the array length, fibrograph length, micronaire value, and Pressley zero and 1/8-inch gauge strength.

All bales were processed identically from opening through roving (appendix table 40). However, because of differences in qualities of the cotton, spinning organization was varied. Twist multipliers and spindle speeds were selected to obtain a sensitive level of end-breakage of about 50 on the bale of cotton ginned without lint cleaning from the early-season harvest for each gin. Then, if the ends-down were not excessive, the triple lint-cleaned bale from the late harvest for that gin was spun using the same twist multiplier and spindle speed. If the late harvest cotton could not be spun with the same organization, either the twist multiplier was increased or the spindle speed was reduced, or both. In all cases, the four bales from each harvest, by gins, were spun identically, even though there were differences in spinning procedure for early and late harvests for cotton from some gins.

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<sup>3/</sup> Tables 22 to 40 are in the appendix.



# MID-SOUTH

# WEST TEXAS

# CALIFORNIA

Figure 1.--Equipment in cotton gins studied, 1961-62



Since spinning organization was varied from one four-bale test to another to achieve a sensitive level of operation, all comparisons are based on performance of the non-lint-cleaned cotton in each test lot.

Results of economic analysis presented in this report are limited mainly to data on the influence of lint cleaning at the gin on grade, staple length, and price per pound of the cotton; on weight and value of the bale; and on additional costs to the ginner. No analysis was made to determine the effects of lint cleaning at gins on (1) the costs of cleaning at mills or (2) the value of the cotton to mills, as reflected in differences in manufacturing performance and costs and in quantity, quality, and value of the products.

#### EFFECT ON GROWER'S RETURNS

The primary reason for using lint cleaners is to improve the grade of lint by removing foreign matter. On the other hand, lint cleaning reduces the weight of the bale. This weight loss can be significant; it may more than offset the influence of grade improvement on the value of the bale, and reduce returns to growers instead of increasing them.

##### Bale Weights

All bales in this study were weighed after three lint cleanings. On the basis of a 500-pound bale equivalent after the third stage of lint cleaning, adjusted bale weights were calculated for each stage of lint cleaning (table 1). Had the bales weighing 500 pounds after three lint cleanings been subjected to only two, the average bale weights for all areas combined would have been approximately 504 pounds. With only one lint cleaner, the bales for the Midsouth would have averaged almost 511 pounds; those from the Texas Plains, 508 pounds; and those from California, approximately 514 pounds. Bale weights before any lint cleaning indicate that for all grades an average of 28 pounds of waste was removed by three lint cleaners from each bale in California; 24 pounds in the Midsouth; and 19 pounds in West Texas. These losses in weight from three stages of lint cleaning averaged 24 pounds per bale for all bales in the study. This is a loss rate of nearly 5 percent, and at present prices of cotton could represent a substantial loss of value to growers unless offset by improvement in grade.

Weight losses varied greatly by grade of cotton and by producing areas. The minimum reduction was 15 pounds per bale on 12 bales of Middling cotton in the Midsouth, and the maximum was 55 pounds per bale on 15 bales of Good Ordinary cotton produced in California. The weight loss from three stages of cleaning was slightly higher for Light Spotted and Spotted cotton than for comparable grades of White cotton. Also, as grade levels before cleaning decreased, the amount of waste removed increased in both White and Spotted cottons.

Table 1.--Average weight per bale of cotton by producing area, grade, and number of lint cleaners, six sample gins, 1961-62

Producing area and grade before lint cleaning	Bales	Bale weight by number of lint cleaners used			
		None	One	Two	Three
	<u>Number</u>	<u>Pounds</u>	<u>Pounds</u>	<u>Pounds</u>	<u>Pounds</u>
<u>Midsouth</u>					
White:					
M.....	12	515	507	502	500
SLM+.....	15	517	508	503	500
SLM.....	79	518	508	503	500
LM+.....	63	521	509	503	500
LM.....	186	525	512	504	500
SGO+.....	14	528	512	504	500
SGO.....	89	530	513	504	500
GO+.....	1	541	519	507	500
GO.....	3	532	516	506	500
BG.....	28	531	513	504	500
Light Spotted:					
M.....	13	516	508	503	500
SLM.....	31	521	510	503	500
LM.....	48	524	510	503	500
Spotted:					
SLM.....	5	522	509	503	500
LM.....	13	528	511	503	500
All bales.....	600	524	511	503	500
<u>West Texas</u>					
White:					
M+.....	1	519	509	503	500
M.....	98	517	507	503	500
SLM+.....	5	523	510	504	500
SLM.....	57	520	509	504	500
LM+.....	8	526	511	505	500
LM.....	36	524	510	504	500
SGO+.....	1	528	512	505	500
BG.....	1	537	515	506	500
Light Spotted:					
SM.....	38	518	508	503	500
M.....	215	518	508	503	500
SLM.....	113	522	509	504	500
LM.....	27	528	512	505	500
All bales.....	600	519	508	504	500
<u>California</u>					
White:					
M.....	27	519	510	503	500
SLM+.....	13	524	412	503	500
SLM.....	254	523	512	503	500
LM+.....	21	530	515	504	500
LM.....	210	530	515	504	500
SGO+.....	1	539	517	505	500
SGO.....	58	544	520	506	500
GO.....	15	555	524	507	500
Light Spotted:					
LM.....	1	540	519	505	500
All bales.....	600	528	514	504	500

## Staple Length, Grade, and Bale Value

Staple length and grade are the major quality factors considered in marketing cotton. Prices on the basis of these factors, along with bale weight, determine the market value of a bale.

Staple Length: Staple is not actually lengthened by lint cleaning, but the operation may straighten and parallel the fibers or improve the appearance in some other way. This may cause a classer to assign a longer staple to cotton that has been lint cleaned.

In this study, this effect was not great enough to be of any economic importance, although there was a statistically significant increase in the staple length designation associated with one lint cleaning (table 2). The effects of adding the second and third lint cleaner are less apparent and not consistent. No significant relationships were found between differences in staple length for different lint cleaner conditions and various grades of cotton.

Grade Distribution: Grades of cotton prior to lint cleaning ran the full range from Strict Middling to Below Grade (appendix tables 22-30).

A high percentage of the samples taken in the gins just before lint cleaning were reduced in grade by the classers because of preparation, or grass. Many were Light Spotted or Spotted; but after two or three lint cleanings, only a few samples were reduced in grade for these causes, and only an occasional sample was classed Light Spotted or Spotted. After one lint cleaning, over 70 percent of the bales--and over 80 percent in California--were classed at a higher grade. With double lint cleaning, fully 95 percent of the bales were improved in grade, and after three lint cleanings nearly every bale in the study had a higher grade.

Bale Values: In determining the effect of lint cleaning on bale value, 14-market average prices for two periods were used. One set of prices was for the 1957-58 season and the other was for November 1961. During the 1957-58 season, differences among prices of different grades were extremely wide. For example, the range between Strict Low Middling and Middling (1-1/16 inch) was 434 points, or \$21.70 a bale. In contrast, in November 1961, the average price differences between these two qualities was only 159 points, or \$7.95 a bale.

With wide differences in prices among grades, the influence of grade improvement generally more than offsets any weight loss resulting from lint cleaning and bale values are increased. On the other hand, when differences in prices are narrow, the effects of weight losses on value may exceed any benefits from improved grades, so that lint cleaning causes net losses in bale values.

In general, average bale values increased as a result of lint cleaning when computed with 1957-58 prices (fig. 2 and table 3). The greatest increase in bale values for all grades combined resulted when one lint cleaner was used. This marked increase was due largely to the fact that a number of bales not subjected to lint cleaning were reduced in grade because of grass or

Table 2.--Average staple length of cotton by producing area, grade, and number of lint cleaners, six sample gins, 1961-62

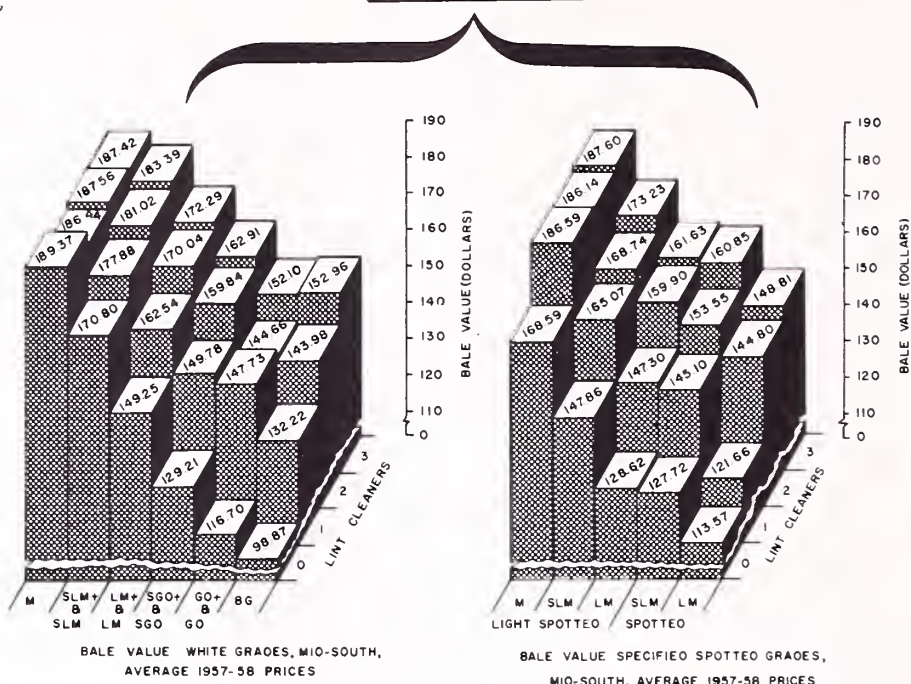
Producing area and grade before lint cleaning	Bales	Length of staple by number of lint cleaners used				Difference for significance 1/	
		None	One	Two	Three	5%	1%
		32ds inch	32ds inch	32ds inch	32ds inch	32ds inch	32ds inch
<u>Midsouth</u>	<u>No.</u>						
White:							
M.....	12	34.75	34.83	34.75	34.67	0.26	0.35
SLM+.....	15	34.80	34.73	34.87	34.87	.13	.17
SLM.....	79	34.80	34.81	34.84	34.76	.08	.11
LM+.....	63	34.86	34.86	34.92	34.83	.09	.11
LM.....	186	34.74	34.80	34.91	34.73	.07	.09
SGO+.....	14	34.86	34.93	34.86	34.86	.08	.10
SGO.....	89	34.54	34.62	34.79	34.72	.10	.13
GO+.....	1	35.00	35.00	35.00	35.00	--	--
GO.....	3	35.00	35.00	35.00	35.00	--	--
BG.....	28	34.75	34.36	34.64	34.82	.22	.29
Light Spotted:							
M.....	13	34.77	34.85	34.77	34.77	.16	.21
SLM.....	31	34.48	34.77	34.61	34.58	.20	.26
LM.....	48	34.50	34.65	34.52	34.73	.18	.23
Spotted:							
SLM.....	5	34.60	34.60	34.20	34.20	.24	.33
LM.....	13	34.77	34.31	34.23	34.31	.32	.43
All bales.....	600	34.70	34.74	34.80	34.73	.04	.05
<u>West Texas</u>							
White:							
M+.....	1	31.00	32.00	32.00	32.00	--	--
M.....	98	30.91	31.06	31.10	31.03	.08	.11
SLM+.....	5	30.60	31.00	31.00	31.20	.44	.61
SLM.....	57	31.02	31.04	31.11	31.02	.09	.12
LM+.....	8	31.38	31.50	31.50	31.50	.10	.14
LM.....	36	30.94	31.00	30.94	31.03	.10	.14
SGO+.....	1	31.00	32.00	31.00	31.00	--	--
BG.....	1	31.00	32.00	31.00	31.00	--	--
Light Spotted:							
SM.....	38	30.74	30.92	30.87	31.00	.15	.20
M.....	215	30.94	31.05	30.98	31.03	.06	.08
SLM.....	113	30.92	31.04	30.89	31.02	.09	.12
LM.....	27	30.81	31.22	30.93	30.89	.19	.25
All bales.....	600	30.92	31.06	31.00	31.02	.04	.05
<u>California</u>							
White:							
M.....	27	35.00	34.96	34.89	35.00	.08	.10
SIM+.....	13	35.00	35.00	35.08	35.00	.08	.10
SIM.....	254	34.97	35.00	34.98	34.99	.03	.04
LM+.....	21	34.95	35.00	35.00	34.95	.09	.12
LM.....	210	34.85	34.96	34.97	34.96	.05	.06
SGO+.....	1	34.00	35.00	35.00	35.00	--	--
SGO.....	58	34.66	34.93	34.81	34.76	.19	.25
GO.....	15	34.73	34.93	34.93	35.00	.08	.11
Light Spotted:							
LM.....	1	35.00	34.00	35.00	34.00	--	--
All bales.....	600	34.89	34.97	34.96	34.96	.03	.04

1/ Differences in 32ds of an inch required for significance.

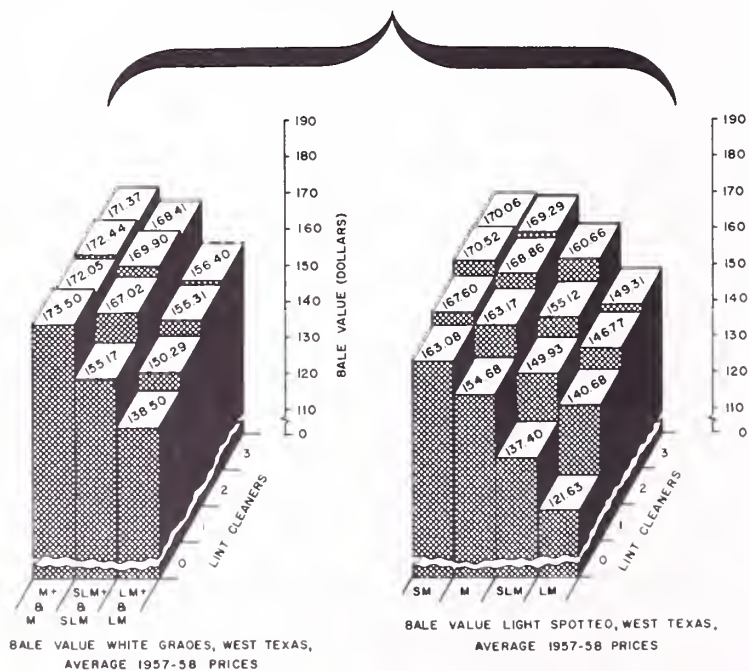


Figure 2.--Bale values of cotton at 1957-58 average prices, before lint cleaning and after one, two, and three lint cleanings.

## MIDSOUTH



## WEST TEXAS



## CALIFORNIA

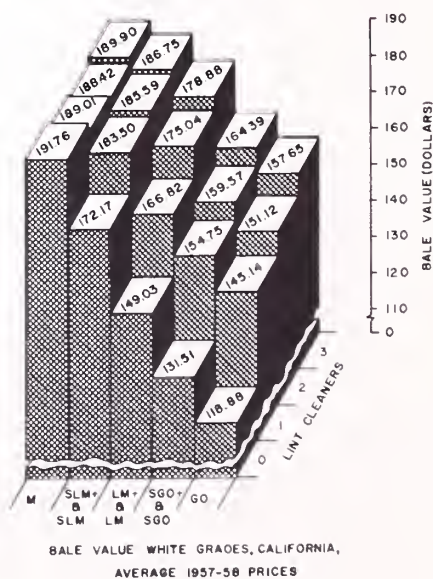




Table 3.--Average value per bale of cotton at 1957-58 prices, by producing area, grade, and number of lint cleaners, six sample gins, 1961-62

Producing area and grade before lint cleaning	Bales	Value by number of lint cleaners used				Difference for significance 1/	
		None	One	Two	Three	5%	1%
	Bales	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
<u>Midsouth</u>							
White:							
M.....	12	189.37	186.44	187.56	187.42	2.37	3.18
SIM+.....	15	179.56	183.07	182.45	185.74	4.44	5.95
SIM.....	79	169.14	176.90	180.75	182.94	1.98	2.61
LM+.....	63	157.92	166.02	173.36	175.80	2.45	3.23
LM.....	186	146.31	161.36	168.92	171.10	1.67	2.20
SGO+.....	14	137.68	148.14	149.51	156.80	5.47	7.32
SGO.....	89	127.88	150.04	161.46	163.87	2.78	3.66
GO+.....	1	123.89	145.22	141.86	164.30	--	--
GO.....	3	114.31	148.57	145.59	148.03	11.90	18.03
BG.....	28	98.87	132.22	143.98	152.96	5.21	6.91
Light Spotted:							
M.....	13	168.59	186.49	186.14	187.60	3.04	4.08
SIM.....	31	147.86	165.07	168.74	173.23	4.09	5.42
LM.....	48	128.62	147.30	159.90	161.63	3.44	4.54
Spotted:							
SIM.....	5	127.72	145.10	153.55	160.85	15.63	21.91
LM.....	13	113.57	121.66	144.80	148.81	6.73	9.03
All bales.....	600	145.16	160.12	167.76	170.61	1.05	1.39
<u>West Texas</u>							
White:							
M+.....	1	176.15	165.43	177.11	176.05	--	--
M.....	98	173.47	172.12	172.39	171.32	.62	.82
SIM+.....	5	164.08	163.65	169.53	168.87	5.99	8.40
SIM.....	57	154.39	167.32	169.93	168.37	1.56	2.06
LM+.....	8	148.16	165.24	169.19	170.09	5.18	7.06
LM.....	36	136.35	146.97	152.22	153.36	3.10	4.10
SGO+.....	1	129.41	156.26	169.78	168.10	--	--
BG.....	1	96.28	139.67	133.48	148.50	--	--
Light Spotted:							
SM.....	38	163.08	167.60	170.52	170.06	1.80	2.39
M.....	215	154.68	163.17	168.86	169.29	.92	1.22
SIM.....	113	137.40	149.33	155.12	160.66	1.88	2.48
LM.....	27	121.63	140.68	146.77	149.31	3.61	4.79
All bales.....	600	152.30	160.69	165.03	166.08	.75	.99
<u>California</u>							
White:							
M.....	27	191.76	189.01	188.42	189.90	.96	1.28
SIM+.....	13	182.87	187.70	186.55	189.04	2.28	3.06
SIM.....	254	171.62	183.28	185.54	186.63	.92	1.21
LM+.....	21	161.14	172.19	178.39	184.06	3.35	4.46
LM.....	210	147.82	166.28	174.71	178.36	1.55	2.04
SGO+.....	1	138.47	157.27	165.94	164.30	--	--
SGO.....	58	131.39	154.71	159.46	164.39	3.29	4.34
GO.....	15	118.88	145.14	151.12	157.65	6.76	9.04
Light Spotted:							
LM.....	1	134.14	153.73	165.94	158.90	--	--
All bales.....	600	158.75	174.18	178.20	180.88	.91	1.20

1/ Difference required in dollars for indicated levels of significance.

preparation. Although the increases for two lint cleaners over one were not so great, they were still impressive. Significant increases for three stages of cleaning over two were also noted in all areas.

The smallest bale value increases for the three areas were found for the gins in Texas. These gins also produced a larger proportion of the higher grades before lint cleaning and, therefore, had less grade improvement from lint cleaning.

Even with the wide grade differentials prevailing in 1957-58, grade improvement for the higher grades was not sufficient to overcome the effect of the loss in bale weights. In Texas and California, bale values of cotton classed originally as Middling with no lint cleaning were significantly lower for all stages of lint cleaning. For cotton originally classed Strict Low Middling plus, lint cleaning greatly increased bale values in California, and to a lesser extent in other areas. For cotton classed as Light Spotted or Spotted, or for the lower White grades with no lint cleaning, bale value increases were significant at each successive stage of lint cleaning.

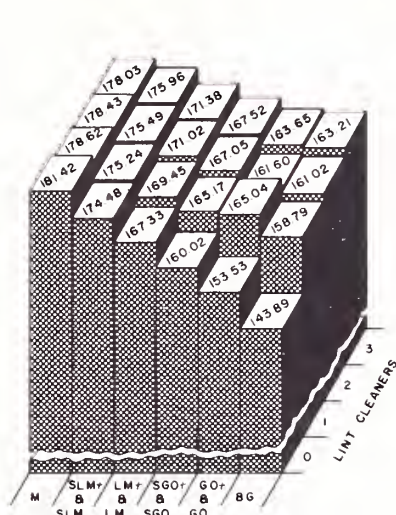
When the narrower grade differentials prevailing in November 1961 were applied to these bale weights and grades, the differences in bale values between stages of lint cleaning were reduced greatly (fig. 3 and table 4). The need for selective use of lint cleaners is apparent, especially when grade differentials are narrow, because the effect of lint cleaning on some grades differed considerably from the average effect. Bale values of Middling White cotton remained about constant, or decreased, with each successive stage of lint cleaning. Strict Low cotton increased significantly in value with the use of the first lint cleaner, but was unchanged or slightly lower when the second and third lint cleaners were used. Bale values of Midsouth and California White cotton classing Low Middling before lint cleaning were increased significantly by the first stage, but values of the California cotton were not changed significantly by the second or third stages and values of the Midsouth cotton were not changed significantly by the third stage. In West Texas, bale values of Low Middling cotton were not increased significantly, even by the first stage of cleaning. Values of cotton classing Below Grade without lint cleaning were increased significantly by each stage of lint cleaning in the Midsouth--the only area with sufficient cotton in the Below Grade category for determination of significance.

Large and statistically significant increases in bale values were caused by one lint cleaning in the Midsouth on cotton classing Middling Light Spotted or Low Middling Light Spotted without lint cleaning. A further increase resulted from use of a second lint cleaner on Low Middling Light Spotted cotton. Bale values of Spotted cottons did not increase significantly until after they were subjected to two cleaners.

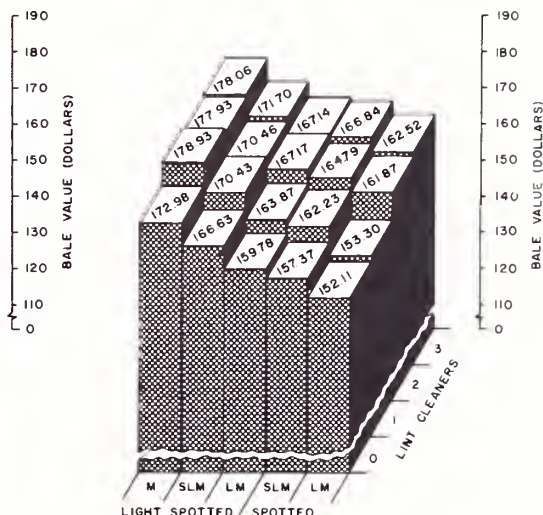
In West Texas, the use of both one and two lint cleaners increased bale values of Middling Light Spotted cotton significantly, but three cleaners were required to obtain a significant increase in Strict Low Middling Light Spotted cotton. Values of Low Middling Light Spotted cotton were increased significantly by the first cleaner only, while Strict Middling Light Spotted cottons were not greatly affected by any stage of lint cleaning.

Figure 3.--Bale values of cotton at 1961 average prices, before lint cleaning and after one, two and three lint cleanings.

## MIDSOUTH

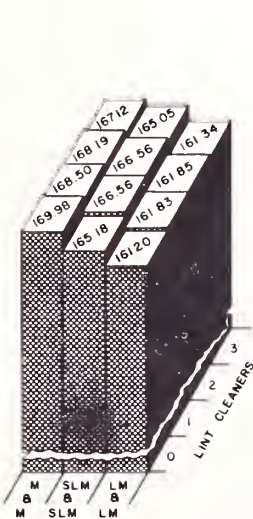


BALE VALUE WHITE GRADES, MIO-SOUTH,  
AVERAGE 1961 PRICES



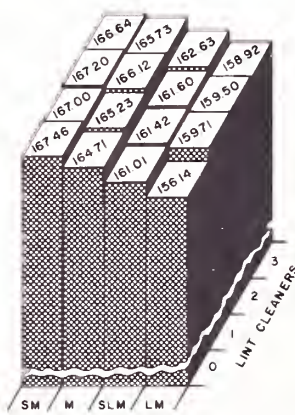
BALE VALUE SPECIFIED SPOTTED GRADES,  
MIO-SOUTH, AVERAGE 1961 PRICES

## WEST TEXAS



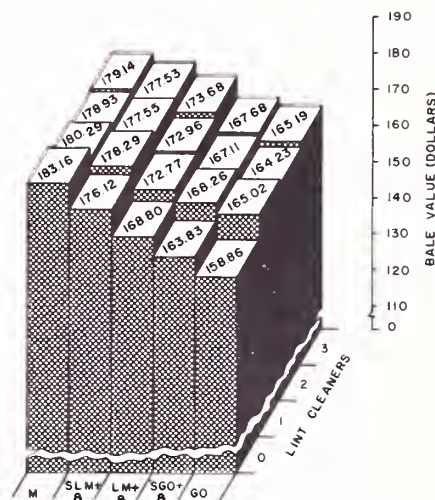
BALE VALUE WHITE GRADES, WEST TEXAS,  
AVERAGE 1961 PRICES

### 1961 LINT CLEANER STUDY



BALE VALUE LIGHT SPOTTED, WEST TEXAS,  
AVERAGE 1961 PRICES

## CALIFORNIA



BALE VALUE WHITE GRADES, CALIFORNIA,  
AVERAGE 1961 PRICES



Table 4.--Average value per bale of cotton at November 1961 prices, by producing area, grade, and number of lint cleaners, six sample gins, 1961-62

Producing area and grade before lint cleaning	Bales	Value by number of lint cleaners used				Differences for significance 1/	
		None	One	Two	Three	5%	1%
	Number	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
<b>Midsouth</b>							
White:							
M.....	12	181.42	178.62	178.43	178.03	1.23	1.64
SLM+.....	15	177.03	177.25	176.07	177.04	2.04	2.73
SLM.....	79	174.00	174.86	175.38	175.75	.82	1.09
LM+.....	63	168.18	170.35	172.17	172.75	1.09	1.43
LM.....	186	167.04	169.14	170.63	170.91	.72	.94
SGO+.....	14	162.03	163.95	163.01	164.65	2.22	2.97
SGO.....	89	159.70	165.36	167.68	167.97	1.21	1.59
GO+.....	1	157.65	165.15	161.33	168.20	--	--
GO.....	3	152.16	165.00	161.69	162.13	5.03	7.62
BG.....	28	143.81	158.79	161.02	163.21	2.02	2.67
Light Spotted:							
M.....	13	172.98	178.92	177.93	178.06	1.34	1.79
SLM.....	31	166.63	170.43	170.46	171.70	1.71	2.26
LM.....	48	159.78	163.87	167.17	167.14	1.33	1.75
Spotted:							
SLM.....	5	157.37	162.23	164.79	166.84	6.38	8.94
LM.....	13	152.11	153.30	161.87	162.52	2.79	3.75
All bales.....	600	165.36	168.68	170.22	170.72	.44	.57
<b>West Texas</b>							
White:							
M+.....	1	171.94	168.02	171.67	170.65	--	--
M.....	98	169.96	168.50	168.15	167.08	.43	.57
SLM+.....	5	167.41	165.67	166.05	165.31	2.02	2.83
SLM.....	57	164.98	166.64	166.61	165.03	.64	.85
LM+.....	8	164.52	167.02	167.05	166.36	1.83	2.49
LM.....	36	160.46	160.68	160.69	160.22	1.00	1.32
SGO+.....	1	157.34	165.43	166.30	164.65	--	--
BG.....	1	142.90	161.20	156.35	158.65	--	--
Light Spotted:							
SM.....	38	167.46	167.00	167.20	166.64	.88	1.16
M.....	215	164.71	165.23	166.12	165.73	.35	.46
SLM.....	113	161.01	161.42	161.60	162.63	.64	.84
LM.....	27	156.14	159.71	159.50	158.92	1.19	1.58
All bales.....	600	164.41	164.80	165.10	164.72	.25	.33
<b>California</b>							
White:							
M.....	27	183.16	180.29	178.93	179.14	.51	.66
SLM+.....	13	179.57	180.01	178.12	178.70	1.15	1.55
SLM.....	254	175.94	178.20	177.52	177.47	.44	.57
LM+.....	21	171.23	174.23	174.46	176.05	1.46	1.94
LM.....	210	168.56	172.62	172.81	173.44	.70	.93
SGO+.....	1	165.31	166.94	169.88	168.20	--	--
SGO.....	58	163.80	168.28	167.06	167.67	1.44	1.91
GO.....	15	158.86	165.02	164.23	165.19	2.82	3.77
Light Spotted:							
LM.....	1	164.75	167.01	169.88	166.70	--	--
All bales.....	600	171.96	174.92	174.48	174.82	.36	.48

1/ Difference required in dollars for indicated levels of significance.

In other words, when cotton is sold on the basis of grade and staple, the net effect of lint cleaning on bale values is influenced considerably by the differences in premiums and discounts among grades. Under one price situation, a specific cleaning practice might increase bale values, particularly for the lower grades; whereas, under another set of prices, the same practice could result in significant losses in bale values.

A Guide to Effective Use of Lint Cleaners: Ginners not only must decide how many stages of lint cleaning to provide in their gins, but also how and when to use these machines once they are installed. Since the quality of individual bales cannot be known in advance, it is not practicable to adjust the stages of lint cleaning so as to maximize returns for each bale. However, the number of stages of lint cleaning can be adjusted readily to the predominant quality of cotton being ginned during a particular period. This requires consideration of relative prices for different grades in addition to frequent checks on the quality of ginned lint. Thus, a ginner may benefit growers by bypassing all lint cleaners during the early part of the season when most of the cotton is handpicked, or when most bales ginned are Middling in grade without lint cleaning. As the season progresses and the quality of cotton declines, the highest average bale values can be obtained by adjusting the number of lint cleaners used from time to time. To make these adjustments when needed requires a method of determining when the grade improvement resulting from a certain stage of lint cleaning is likely to offset the weight losses. This, of course, depends on the differences in price per pound for different grades and also on the quantity of waste removed by lint cleaning.

To provide some guidance in determining when weight losses would be offset by increases in grade, a system of "break-even" ratios of prices for successive grades has been worked out for the grades most commonly encountered in this study and without allowance for added cost to the ginner (table 5). These ratios take into account both grade improvement and bale weight losses. They are the ratios of price per pound for the next higher grade to the price of the specified grade which would have to be equaled if bale value is not to decrease from the indicated lint cleaning. To illustrate, suppose Strict Low Middling cotton were being ginned in the Midsouth with no lint cleaning. Then the price for Middling divided by the price for Strict Low Middling cotton would have to equal 1.041 (break-even ratio) to insure the same bale value if the first stage of lint cleaning were used. If the ratio exceeded this amount, the average bale value would probably be increased as a result of one lint cleaning. If it were less, the bale value would be decreased.

The same procedure would be followed to determine the effect of subsequent stages of lint cleaning. As a further illustration, if the gin were turning out Strict Low Middling with one lint cleaner, then the ratio of the price for Middling to the price for Strict Low Middling would have to exceed 1.033 for the second lint cleaner to increase bale values.

Specifically, in 1957-58, the average price for 1-3/32-inch Middling cotton was 36.97 cents and that for Strict Low Middling was 32.86 cents (appendix table 31). This results in a ratio of Middling price to Strict Low Middling price of 1.125, and is far in excess of the price ratios necessary for weight losses from cleaning Strict Low Middling to be offset by grade



Table 5.--Ratio of the price per pound of the next higher grade to specified grades of cotton required for bale values to break even as a result of specified stages of lint cleaning 1/

Grade before cleaning	Change in number of lint cleaner stages		
	None to one	One to two	Two to three
	<u>Ratio</u>	<u>Ratio</u>	<u>Ratio</u>
<u>Midsouth:</u>			
Middling.....	<u>2/</u>	1.110	<u>3/</u>
Strict Low Middling.....	1.041	1.033	1.026
Low Middling.....	1.035	1.027	1.015
<u>West Texas:</u>			
Middling.....	1.040	1.020	1.093
Strict Low Middling <u>2/</u> .....	1.028	1.033	1.032
Low Middling.....	1.035	1.018	<u>4/</u>
<u>California:</u>			
Middling.....	1.138	1.091	1.016
Strict Low Middling.....	1.037	1.038	1.021
Low Middling.....	1.038	1.030	1.017

1/ These price ratios are based on average grade improvements and associated bale weight losses found in the 1961 lint cleaner study.

Example 1: If a gin in the Midsouth is producing Middling cotton with one lint cleaner, the price of Strict Middling for the appropriate staple length divided by price of Middling would have to equal or exceed the ratio of 1.110 for one lint cleaner to improve grade of cotton enough to offset weight loss.

Example 2: If the Midsouth gin were producing Strict Low Middling with no lint cleaner, the price of Middling divided by the price of Strict Low Middling would have to equal or exceed the ratio of 1.041 for the grade improvement of one lint cleaner to offset the weight loss.

Example 3: If a West Texas gin were producing Strict Low Middling with one lint cleaner, the price of Middling divided by Strict Low Middling would have to equal or exceed the ratio of 1.033 for the grade improvement of a second lint cleaner to offset the associated weight loss.

2/ Ratio not computed. Number of samples insufficient for reliable estimate.

3/ Average grade actually decreased as a result of the third lint cleaner's action on Middling cotton from two lint cleaners because some samples were classed as Light Gray.

4/ No samples classed Low Middling after two lint cleaners.

improvement. However, at November 1961 prices for this grade and staple (appendix table 32), the ratio is 1.050, which is only moderately higher than those indicated for equal bale values. Only a small bale value increase would result from adding lint cleaning stages.

### COST OF LINT CLEANING AT GINS

The type and arrangement of saw cylinder lint cleaners varies among gins, depending on the gin's design, the space available, and the preferences of individual ginners. The first stage of lint cleaning is generally carried out either with individual cleaners designed to follow each stand, or with a bulk-type cleaner through which the lint from all gin stands is channeled. Succeeding stages of cleaning are more frequently accomplished with bulk-type cleaners.

Bulk-type cleaners may be either single or double units, depending on whether they have one or two saw cylinders. The flow of cotton into double-unit cleaners is usually split, with half of the cotton directed to each saw cylinder. This setup is referred to as a split-stream installation and provides approximately twice the capacity of a single-unit model.

The greater popularity, in many localities, of individual lint cleaners following each gin stand raised the question as to which of these two types of installations to consider as typical at the first stage of cleaning. Further investigation indicated, however, that there was actually little difference in total operating costs between a battery of individual or unit cleaners, and one bulk-type cleaner of comparable capacity. Hence, the decision was made to base cost calculations on the bulk-type cleaner at this stage of cleaning as well as at later stages.

In many areas there are both low-capacity gin plants capable of ginning 5 to 6 bales per hour and new, high-capacity plants capable of ginning 12 to 15 bales per hour. Gins handling no more than 5 to 6 bales per hour may satisfactorily use single-stream, bulk-type cleaners. Gins with higher capacities require the larger, split-stream models. Costs were computed for one, two, and three stages of cleaning for each of these two models of cleaners in the Midsouth and Texas areas, where both types of equipment are common; but in California, where nearly all larger gins have the split-stream type, costs were computed for split-stream equipment only.

### Capital Investment

The installed cost of a bulk-type lint cleaner, complete with all necessary motors, fans, and other accessories, ranged from approximately \$12,000 for the single-stream model and \$19,000 for the split-stream model in both the Texas High Plains and the Midsouth to about \$12,300 and \$19,500, respectively, in the San Joaquin Valley. The cost increments for each like unit of lint cleaning machinery added were about equal. Hence, two stages of lint cleaning consisting of two split-stream bulk-type cleaners in series cost approximately \$39,000 installed in the San Joaquin Valley, while a third stage cost another

\$19,500, or a total of approximately \$58,500 for a three-stage installation. No allowance was made in these estimates for building alterations or additions.

### Fixed Costs

The cost of operating gin machinery and equipment can be divided into fixed and variable costs. Fixed, or overhead, costs are those which are inescapable, even if there is no output.

Among the items included under fixed costs are depreciation, interest on investment, insurance, and taxes. Depreciation was figured by the straight line method at 10 percent of the replacement cost, less salvage value. Interest was computed at 5 percent on the average investment.

Insurance rates and methods of underwriting gin insurance varied considerably from area to area. In the San Joaquin Valley and in the Midsouth, gin plants were usually insured at 80 percent of actual cash value. In the Texas High Plains, coverage was about 85 percent of value. Variations in rates among areas, however, were substantial, due mainly to differences in types of building construction and degrees of fire protection available. The San Joaquin gins enjoyed a definite insurance rate advantage at 44 cents per \$100, compared with 80 cents for the Texas High Plains and \$1 for the Midsouth.

Tax rates and methods of assessment also vary considerably both within and among areas. In the San Joaquin Valley, most gin plants were assessed at 25 percent of replacement cost minus depreciation. In the Texas High Plains, this figure was 16 percent and for the Midsouth, 10 percent. The average rates per \$100 of assessed valuation ranged from less than \$2 in the High Plains to nearly \$6.50 in the San Joaquin Valley.

### Variable Costs

Variable costs differ from fixed costs in that they are dependent on total output. Lint cleaning costs which vary with changes in volume of production include power, labor, and to a lesser degree, repairs and maintenance. Electric power rates were more favorable to San Joaquin cotton gins, averaging 1.86 cents per kilowatt-hour for that area, compared to 2.62 cents for the Texas High Plains and 2.93 cents for the Midsouth gins.

Labor rates, too, varied considerably among areas, ranging from \$1 per hour in the Midsouth to \$1.90 in the San Joaquin Valley. Generally, one man in the gin crew was assigned the task of tending the lint cleaners. This, however, was only one of his responsibilities and, hence, only that portion of his time devoted to the lint cleaning machinery was charged to this operation. An estimated one-fourth of a man-work-unit was required for one stage of lint cleaning, three-eighths for two stages, and one-half for three stages in all areas. No allowance was made for management because only a negligible proportion could be allocated to lint cleaning alone.

Repairs and maintenance, although truly variable cost items, were treated as fixed costs in this analysis, due to lack of sufficient data on the relationships between lint cleaner repair costs and volumes ginned. These costs were set at \$175 and \$200 per stage of cleaning for single and split-stream models, respectively.

### Total Cost of Lint Cleaning

The total hourly costs of lint cleaning averaged roughly \$2.50 per hour for each stage of single-stream and \$4 per hour for each stage of split-stream cleaning (tables 6, 7, and 8). Although certain cost items varied considerably among the three areas, these rather wide differences tended to cancel out in the aggregate.

Fixed costs are about one-eighth of the original cost of the lint cleaning machinery, and are the major portion of the total operating costs of this equipment. Depreciation, at approximately \$1.07 per hour per stage of single-stream cleaning and \$1.75 for split-stream cleaning, was the largest single cost item.

Power was the largest variable cost item in lint cleaning, amounting to 20 percent of the total cost of split-stream cleaning in the San Joaquin Valley and 30 percent of the total in the other two areas studied. Power cost for operating the smaller single-stream cleaners was 25 percent of the total operating cost of this equipment in both the Texas High Plains and the Midsouth. Labor cost for lint cleaning ranged from 4 to 12 percent of the total operating cost, depending on the area and stage of cleaning.

Increasing the annual rate of output reduces costs of lint cleaning per bale, but at a declining rate (fig. 4). Likewise, a drop in rate of production sharply raises costs of lint cleaning. For example, if a gin in the San Joaquin Valley with split-stream lint cleaning in two stages, and with an annual rate of production of 6 bales per hour, could increase its average output to 9 bales per hour, it would realize a net cost reduction of only 33 percent, or 44 cents per bale. On the other hand, if its annual rate declined an equal amount, from 6 to 3 bales per hour, unit costs would increase 100 percent, or \$1.32 per bale.

Since separate charges usually are not assessed for lint cleaning, individual farmers are not concerned immediately with balancing potential gains from lint cleaning against additional ginning costs. However, it appears that in the long run ginners must pass all, or a substantial part, of this cost back to their farmer patrons. Growers' income from the sale of cotton that was Middling (or better) White before cleaning would then be reduced by the cost of cleaning as well as by the loss in bale weight. Also, growers' potential gains from cleaning some other grades would be largely offset.

The use of one lint cleaner on Strict Low Middling (or lower) White grades or on Light Spotted, Spotted, or Below Grade cotton appears to be profitable to growers, even if they paid the full cost of cleaning and if price differentials were smaller than 1961-62. Two, and even three, lint cleaners



Table 6.--Hourly and per bale costs of lint cleaning at gins using bulk-type cleaners, by cost item and stage of cleaning, Midsouth, 1961-62

Cost item and stage of lint cleaning	Single-stream cleaning				Split-stream cleaning			
	Per	Per bale at			Per	Per bale at		
	oper-	specified hourly			oper-	specified hourly		
	ating	rate of ginning			ating	rate of ginning		
	: hour	: 2	: 4	: 6	: hour	: 6	: 9	: 12
	: 1/	: bales	: bales	: bales	: 1/	: bales	: bales	: bales
	: <u>Dol.</u>	<u>Dol.</u>	<u>Dol.</u>	<u>Dol.</u>	<u>Dol.</u>	<u>Dol.</u>	<u>Dol.</u>	<u>Dol.</u>
<u>One stage</u>								
Depreciation.....	1.07	0.53	0.26	0.17	1.72	0.29	0.19	0.14
Interest on investment..	.30	.15	.08	.05	.48	.08	.05	.04
Insurance.....	.10	.05	.03	.02	.15	.02	.02	.01
Taxes.....	.06	.03	.02	.01	.09	.02	.01	.01
Power.....	.64	.32	.15	.11	1.27	.21	.14	.11
Labor.....	.24	.12	.06	.04	.25	.04	.03	.02
Repairs.....	.15	.08	.04	.03	.20	.03	.02	.02
Total.....	2.56	1.28	.64	.43	4.16	.69	.46	.35
<u>Two stages</u>								
Depreciation.....	2.16	1.07	.54	.36	3.45	.58	.38	.30
Interest on investment..	.60	.30	.15	.10	.96	.16	.11	.08
Insurance.....	.19	.10	.05	.03	.30	.05	.03	.02
Taxes.....	.11	.06	.03	.02	.18	.03	.02	.01
Power.....	1.28	.64	.32	.21	2.54	.42	.28	.21
Labor.....	.36	.18	.09	.06	.38	.06	.04	.03
Repairs.....	.30	.15	.07	.05	.40	.07	.05	.03
Total.....	5.00	2.50	1.25	.83	8.21	1.37	.91	.68
<u>Three stages</u>								
Depreciation.....	3.24	1.62	.81	.54	5.17	.86	.57	.43
Interest on investment..	.90	.45	.23	.15	1.44	.24	.16	.12
Insurance.....	.29	.15	.07	.05	.46	.08	.05	.04
Taxes.....	.17	.08	.04	.03	.27	.04	.03	.02
Power.....	1.92	.96	.48	.32	3.81	.64	.42	.32
Labor.....	.48	.24	.12	.08	.50	.08	.06	.04
Repairs.....	.45	.23	.11	.07	.60	.10	.07	.05
Total.....	7.45	3.73	1.86	1.24	12.25	2.04	1.36	1.02

1/ Based on assumption that each lint cleaner was in use an average of 1,000 hours annually.



Table 7.--Hourly and per bale costs of lint cleaning at gins using bulk-type cleaners, by cost item and stage of cleaning, Texas High Plains, 1961-62

Cost item and stage of lint cleaning	Single-stream cleaning				Split-stream cleaning			
	Per	Per bale at			Per	Per bale at		
	oper-	specified hourly			oper-	specified hourly		
	ating	rate of ginning			ating	rate of ginning		
	hour	2	4	6	hour	6	9	12
	1/	bales	bales	bales	1/	bales	bales	bales
	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.
<u>One stage</u>								
Depreciation.....	1.08	0.54	0.27	0.18	1.72	0.29	0.20	0.14
Interest on investment...	.30	.15	.08	.05	.48	.08	.05	.04
Insurance.....	.08	.04	.02	.01	.13	.02	.01	.01
Taxes.....	.03	.02	.01	.01	.05	.01	.01	2/
Power.....	.57	.28	.14	.10	1.14	.19	.13	.10
Labor.....	.30	.15	.07	.05	.31	.05	.03	.03
Repairs.....	.15	.08	.04	.02	.20	.03	.02	.02
Total.....	2.51	1.26	.63	.42	4.03	.67	.45	.34
<u>Two stages</u>								
Depreciation.....	2.16	1.08	.54	.36	3.44	.57	.39	.29
Interest on investment...	.60	.30	.15	.10	.96	.16	.11	.08
Insurance.....	.16	.08	.04	.03	.26	.04	.03	.02
Taxes.....	.07	.04	.02	.01	.10	.02	.01	.01
Power.....	1.14	.57	.28	.19	2.27	.38	.25	.19
Labor.....	.48	.24	.12	.08	.47	.08	.05	.04
Repairs.....	.30	.15	.08	.05	.40	.07	.04	.03
Total.....	4.91	2.46	1.23	.82	7.90	1.32	.88	.66
<u>Three stages</u>								
Depreciation.....	3.24	1.62	.81	.54	5.16	.86	.57	.43
Interest on investment...	.90	.45	.22	.15	1.44	.24	.16	.12
Insurance.....	.25	.12	.06	.04	.39	.07	.04	.03
Taxes.....	.10	.05	.03	.02	.15	.02	.02	.01
Power.....	1.70	.85	.42	.28	3.41	.57	.38	.29
Labor.....	.60	.30	.15	.10	.62	.10	.07	.05
Repairs.....	.45	.23	.12	.08	.60	.10	.07	.05
Total.....	7.24	3.62	1.81	1.21	11.77	1.96	1.31	.98

1/ Based on assumption that each lint cleaner was in use an average of 1,000 hours annually.

2/ Less than \$0.005.

Table 8.--Hourly and per bale costs of lint cleaning at gins using bulk-type cleaners, by cost item and stage of cleaning, San Joaquin Valley, California, 1961-62 <sup>1/</sup>

Cost item and stage of lint cleaning	Split-stream cleaning			
	Per operating hour <sup>2/</sup>	Per bale at specified hourly rate of ginning		
		6 bales	9 bales	12 bales
	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>
<u>One stage</u>				
Depreciation.....	1.76	0.29	0.20	0.14
Interest on investment.....	.49	.08	.05	.04
Insurance.....	.07	.01	.01	.01
Taxes.....	.28	.05	.03	.02
Power.....	.81	.14	.09	.07
Labor.....	.48	.08	.05	.04
Repairs.....	.20	.03	.02	.02
Total.....	4.09	.68	.45	.34
<u>Two stages</u>				
Depreciation.....	3.52	.59	.39	.30
Interest on investment.....	.98	.16	.11	.08
Insurance.....	.14	.02	.02	.01
Taxes.....	.56	.09	.06	.05
Power.....	1.61	.27	.18	.13
Labor.....	.71	.12	.08	.06
Repairs.....	.40	.07	.04	.03
Total.....	7.92	1.32	.88	.66
<u>Three stages</u>				
Depreciation.....	5.28	.88	.59	.44
Interest on investment.....	1.47	.24	.16	.12
Insurance.....	.21	.04	.02	.02
Taxes.....	.84	.14	.09	.07
Power.....	2.42	.40	.27	.20
Labor.....	.96	.16	.11	.08
Repairs.....	.60	.10	.07	.05
Total.....	11.78	1.96	1.31	.98

<sup>1/</sup> Calculations were made for split-stream cleaning only since there were no known single-stream installations in California.

<sup>2/</sup> Based on the assumption that each lint cleaner was in use an average of 1,000 hours annually.

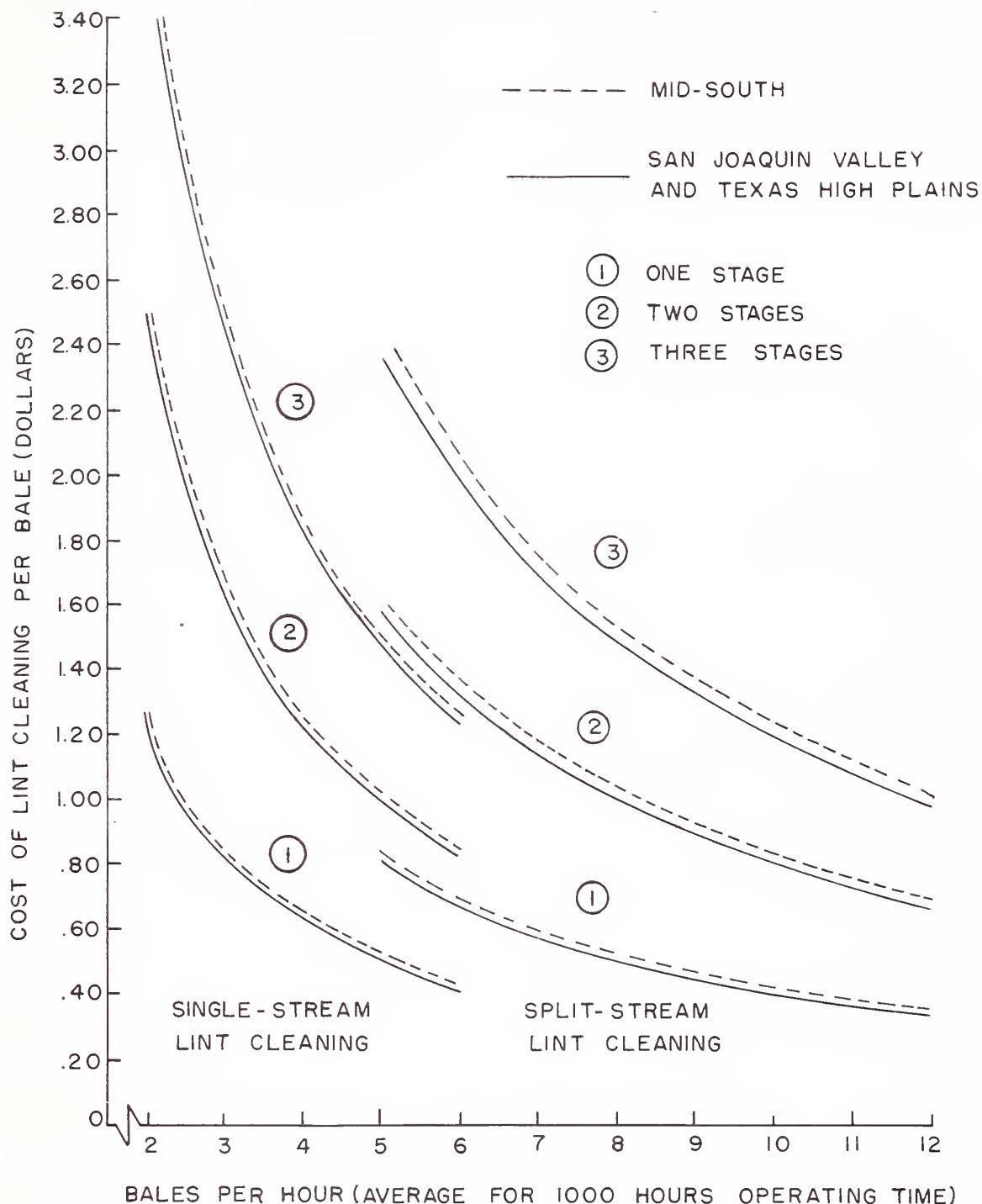


Figure 4.--Relationships between rate of ginning cotton and costs per bale for bulk-type lint cleaning, by area and by number of stages of cleaning, 1961-62. (The solid line applies only to Texas for single-stream cleaning, since there were no known installations of this kind in the San Joaquin Valley.)

might be profitable in the Midsouth area, even with this price situation, when used on the lowest grades of White or Light Spotted, Spotted, or Below Grades, or cotton which would otherwise be reduced in grade because of grass or preparation. But in West Texas or California, when price differences are small, it is doubtful that more than one lint cleaner can be used profitably, even on the lowest grades, if the cost of cleaning must be borne by farmers. Furthermore, if lint cleaning at gins materially reduces the usefulness of the cotton to mills, benefits to individual producers from this practice may be at the expense of the cotton industry as a whole.

## FIBER AND SPINNING TESTS

Although cotton producers may be more concerned with the immediate effects of lint cleaners on bale values and ginning cost, the long-run effect on use value of fibers is more important to the industry as a whole. The present study provides some indication of these effects.

Micronaire fineness and Pressley strength tests did not show significant differences between lots subjected to different stages of lint cleaning. These data, along with the fibrograph measurements, which indicated essentially the same relationships as those from the array, are in the appendix (tables 34-39).

### Classification

Ten of the 12 bales subjected to one lint cleaner graded higher than those not lint cleaned (table 9). Nine out of 12 bales subjected to two lint cleaners graded higher than comparable bales with one lint cleaner. The third lint cleaner caused no appreciable grade change.

However, of the 12 bales subjected to two lint cleanings, 6 were Strict Middling, 3 were Middling, and 2 were Middling Light Spotted. Little grade improvement could be expected from further lint cleaning. These lots were harvested from selected fields which had received good cultural treatment during the growing season.

The classer's staple length did not differ significantly among lots subjected to different stages of lint cleaning.

### Fiber Length (Array)

Upper Quartile Length: The average upper quartile length generally fell slightly with the addition of each lint cleaning, with a statistically significant difference between the second and third cleaner stages (table 10). Of the 12 bales ginned with one lint cleaner, the upper quartile length was less for six, the same for five, and greater for one than for corresponding bales ginned without lint cleaning. Five of the 12 lots ginned with two lint cleaners, compared to those ginned with one, were shorter at the upper quartile, five were the same, and two were longer. Nine of the 12 lots ginned with three cleaners had upper quartile measurements shorter than those ginned with two lint cleaners, while two remained the same and one was longer.



Table 9.--Grade and staple length of spinning lots of cotton, by gins, seasons, and number of lint cleaners, 1961-62

Season and gin number		Number of lint cleaners			
		None	One	Two	Three
		<u>Grade</u>			
Gin No. 1:					
Early.....	SLM	M	M	M	
Late.....	LM+	SLM	SLM+	SLM+	
Gin No. 2:					
Early.....	LM+	SLM	M	M	
Late.....	SLM Lt. Sp.	M Lt. Sp.	M	M	
Gin No. 3:					
Early.....	M Lt.Sp/SM Lt.Sp. <u>1/</u>	SM Lt. Sp.	SM	SM	
Late.....	SLM Lt.Sp/M Lt.Sp. <u>1/</u>	SM Lt. Sp.	M Lt. Sp.	SM Lt. Sp.	
Gin No. 4:					
Early.....	M Lt. Sp.	M	SM	SM	
Late.....	SLM Lt. Sp.	SLM Lt. Sp.	M Lt. Sp.	M	
Gin No. 5:					
Early.....	M	SM	SM	SM	
Late.....	LM/SLM <u>1/</u>	M	SM	SM	
Gin No. 6:					
Early.....	M	M	SM	SM	
Late.....	M	M+	SM	SM	
		<u>Grade Index</u>			
Average early...	96	100	103	103	
Average late...	90	97	100	101	
Grand average...	93	99	101	102	
		<u>Staple length in 32ds inch</u>			
Gin No. 1:					
Early.....	36	36	35	35	
Late.....	35	35	36	35	
Gin No. 2:					
Early.....	36	36	36	36	
Late.....	35	35	35	34	
Gin No. 3:					
Early.....	31	31	31	31	
Late.....	31	31	31	30	
Gin No. 4:					
Early.....	31	32	32	31	
Late.....	30	31	31	30	
Gin No. 5:					
Early.....	35	35	35	35	
Late.....	35	36	36	35	
Gin No. 6:					
Early.....	35	35	35	35	
Late.....	36	35	35	35	
Average early...	34	34	34	34	
Average late...	34	34	34	33	
Grand average...	34	34	34	35	

1/ Reduced in grade due to preparation.

Table 10.--Upper quartile length of cotton fiber (array method) by seasons and number of lint cleaners, six sample gins, 1961-62

Season and gin number	Number of lint cleaners			
	None	One	Two	Three
	<u>Inches</u>	<u>Inches</u>	<u>Inches</u>	<u>Inches</u>
Early season:				
1.....	1.24	1.24	1.24	1.20
2.....	1.28	1.26	1.26	1.24
3.....	1.12	1.12	1.09	1.08
4.....	1.08	1.08	1.08	1.07
5.....	1.21	1.20	1.19	1.20
6.....	1.22	1.20	1.20	1.18
Average.....	1.19	1.18	1.18	1.16
Late season:				
1.....	1.22	1.22	1.21	1.20
2.....	1.25	1.24	1.22	1.20
3.....	1.02	1.01	1.02	1.02
4.....	1.05	1.04	1.04	1.02
5.....	1.20	1.21	1.22	1.22
6.....	1.20	1.20	1.18	1.16
Average.....	1.16	1.15	1.15	1.14
Average both seasons.....	1.17	1.17	1.16	1.15

Mean Length: The use of additional lint cleaners also caused a progressive reduction in mean length of cotton fibers at each stage of cleaning. The addition of the first lint cleaner was associated with an average reduction of .01 inch and the addition of the second and third were each associated with an average reduction of about .02 inch (table 11). The mean length of cottons in lots subjected to two lint cleaners differed significantly from that for lots not lint cleaned and the mean length after three stages differed significantly, both from that with no lint cleaning and one lint cleaning. Addition of the first lint cleaner caused a reduction in the mean length of fiber for 9 out of 12 lots, addition of the second lint cleaner caused a reduction in 8 out of 12 lots, and addition of the third lint cleaner reduced 8 out of 12 lots.

Coefficient of Length Variability: The use of additional lint cleaners caused an increase in the coefficient of length variability (table 12). The addition of the first lint cleaner resulted in an increase in length variability in 7 out of 12 lots, with 5 of the 12 lots remaining the same. The addition of the second and third lint cleaners each resulted in an increase for 8 out of 12 lots when compared with bales at the preceding lint cleaner stage. All bales processed through three stages of lint cleaning had a higher coefficient of length variability than corresponding bales with no lint cleaning.

Table 11.--Mean length of cotton fiber (array method) by seasons and number of lint cleaners, six sample gins, 1961-62

Season and gin number	Number of lint cleaners			
	None	One	Two	Three
	<u>Inches</u>	<u>Inches</u>	<u>Inches</u>	<u>Inches</u>
Early season:				
1.....	1.03	1.02	1.02	0.96
2.....	1.09	1.07	1.06	1.04
3.....	.93	.94	.88	.87
4.....	.90	.89	.88	.88
5.....	1.04	1.01	1.00	1.00
6.....	1.04	1.02	1.00	.96
Average.....	1.00	.99	.97	.95
Late season:				
1.....	1.00	.99	.96	.96
2.....	1.01	1.00	.96	.93
3.....	.84	.82	.85	.83
4.....	.84	.82	.82	.78
5.....	1.02	1.02	1.02	1.02
6.....	.98	1.00	.97	.94
Average.....	.95	.94	.93	.91
Average both seasons.....	.98	.97	.95	.93

Table 12.--Coefficient of length variability of cotton fibers (array method), by seasons and number of lint cleaners, six sample gins, 1961-62

Season and gin number	Number of lint cleaners			
	None	One	Two	Three
	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Early season:				
1.....	29	30	31	34
2.....	26	26	28	30
3.....	28	28	32	32
4.....	28	30	30	30
5.....	26	26	26	28
6.....	25	26	29	30
Average.....	27	28	29	31
Late season:				
1.....	30	31	34	34
2.....	32	34	35	36
3.....	30	32	28	31
4.....	34	36	36	38
5.....	26	26	27	27
6.....	28	28	30	32
Average.....	30	31	32	33
Average both seasons.....	29	30	31	32

Each additional lint cleaner caused an increase in average length variability, raising the average from 28.5 percent without lint cleaning to 29.4 percent at the first stage, to 30.5 at the second stage, and to 31.8 percent at the third. The variability for the third stage of lint cleaning was significantly different from that for none and one lint cleaning stages.

Percentage of Fibers Longer than 1 Inch: Lint cleaning caused a reduction in the percentage of long fibers (table 13). One lint cleaning caused a decrease in percentage of long fibers in 11 out of 12 bales. The average decreased from 56.2 to 54.4 percent. Ten out of 12 lots had lower proportions of long fibers when bales ginned with two lint cleaners were compared with those ginned with one. This was also true when bales ginned with three lint cleaners were compared with those ginned with two. The proportion of long fibers in lots ginned with two cleaners averaged only 52.2 percent and those ginned with three averaged only 49.7, indicating a progressively greater reduction with each additional lint cleaner treatment.

The overall average also indicates that the use of additional lint cleaners may affect the percentage of long fibers in early-season cotton to a greater extent than in late-season cotton.

Table 13.--Percentage of cotton fibers longer than 1 inch (array method), by seasons and number of lint cleaners, six sample gins, 1961-62

Season and gin number	Number of lint cleaners			
	None	One	Two	Three
	Percent	Percent	Percent	Percent
Early season:				
1.....	66.4	64.7	63.0	55.8
2.....	73.8	71.0	69.6	65.6
3.....	50.0	48.6	43.0	40.6
4.....	39.4	39.2	36.4	36.4
5.....	67.3	62.8	62.8	60.3
6.....	65.8	62.8	60.0	55.8
Average.....	60.4	58.2	55.8	52.4
Late season:				
1.....	61.0	59.1	56.8	55.4
2.....	61.6	59.8	55.2	53.3
3.....	29.0	27.1	28.8	27.8
4.....	35.1	31.4	30.8	27.4
5.....	66.6	64.4	63.2	65.9
6.....	58.4	61.4	56.4	52.1
Average.....	52.0	50.5	48.5	47.0
Average both seasons.....	56.2	54.4	52.2	49.7

Percentage of Fibers 1/2 to 1 Inch: The percentage of fibers 1/2 to 1 inch was higher at each successive stage of lint cleaning, increasing on the average 1.4 percentage points with each lint cleaning (table 14). The



Table 14.--Percentage of cotton fibers 1/2 to 1 inch long (array method) by season and number of lint cleaners, six sample gins, 1961-62

Season and gin number	Number of lint cleaners			
	None	One	Two	Three
	Percent	Percent	Percent	Percent
Early season:				
1.....	25.6	27.1	27.7	32.5
2.....	20.6	22.6	23.7	26.6
3.....	41.0	42.8	44.6	46.8
4.....	52.2	50.7	54.6	53.5
5.....	26.7	30.8	30.5	32.6
6.....	28.6	30.8	31.8	34.8
Average.....	32.4	34.1	35.5	37.8
Late season:				
1.....	30.5	31.6	31.6	33.1
2.....	27.6	29.1	32.6	33.3
3.....	59.2	59.8	60.4	60.1
4.....	49.8	53.0	52.5	53.5
5.....	27.6	29.3	30.2	27.3
6.....	33.6	30.8	34.2	37.4
Average.....	38.0	38.9	40.2	40.8
Average both seasons.....	35.2	36.5	37.9	39.3

increase in proportion of fibers in this length category was not as much as the decrease in fibers 1 inch and longer, indicating that some portion of the longer fibers was broken into lengths shorter than 1/2 inch and, also, perhaps some breakage occurred in fibers in the 1/2 to 1 inch range.

Percentage of Fibers Shorter than 1/2 Inch: In general, there was a continuous and progressive increase in proportion of fibers shorter than 1/2 inch as lint cleaning increased (table 15). Subjecting the cotton to one lint cleaning resulted in an increase in the proportion of short fibers in 10 of the 12 bales. Addition of the second lint cleaner treatment increased the short fibers in 10 of the 12 bales, and addition of the third lint cleaning caused an increase in 11 of the 12 bales.

The overall average short fiber content for lots ginned with one lint cleaner was 0.5 percentage point higher than the average for lots ginned without lint cleaning. Use of the second lint cleaner increased short fiber content 0.9 percent higher than the first, and the third, 1.0 percentage point over the second. This is an accumulated increase of 2.4 percentage points in short fiber content and it is statistically significant.

Table 15.--Percentage of cotton fibers shorter than 1/2-inch (array method) by seasons and number of lint cleaners, six sample gins, 1961-62

Season and gin number	Number of lint cleaners			
	None	One	Two	Three
	Percent	Percent	Percent	Percent
Early season:				
1.....	8.0	8.2	9.4	11.6
2.....	5.6	6.3	6.8	7.8
3.....	9.0	8.6	12.5	12.6
4.....	8.4	10.0	9.0	10.1
5.....	6.0	6.6	6.7	7.2
6.....	5.6	6.4	8.3	9.4
Average.....	7.1	7.7	8.8	9.8
Late season:				
1.....	8.6	9.2	11.6	11.5
2.....	10.8	11.2	12.2	13.4
3.....	11.8	13.3	10.6	12.1
4.....	15.0	15.6	16.7	19.2
5.....	5.9	6.4	6.6	6.8
6.....	8.2	7.8	9.4	10.6
Average.....	10.0	10.6	11.2	12.3
Average both seasons.....	8.6	9.1	10.0	11.0

### Waste

Non-Lint Content (Shirley Analyzer): The use of one lint cleaner caused a highly significant reduction in both non-lint content and manufacturing waste (tables 16 and 17). The second and third lint cleaner resulted in further but progressively smaller reductions.

### Neps in Card Web

The addition of each lint cleaner caused an increase in neps per 100 square inches of card web (table 18). The use of the first lint cleaner caused an increase in neps for 10 of 12 bales, the use of the second lint cleaner further increased neps in 11 out of 12 bales, and the use of the third lint cleaner increased neps in 8 out of 12 bales. All of the bales subjected to three cleaners had a greater number of neps than those not lint cleaned.

The overall trend indicates that the use of each additional lint cleaner increased the nep count approximately 5 neps with a grand average of 22 without lint cleaning and 36 for three lint cleanings. The use of two and three lint cleaners resulted in a significantly greater number of neps than no lint cleaning and the use of the third cleaner resulted in a significantly higher number than one cleaner.

Table 16.--Non-lint content of ginned cotton by seasons and number of lint cleaners, six sample gins, 1961-62

Season and gin number	Number of lint cleaners			
	None	One	Two	Three
	Percent	Percent	Percent	Percent
Early season:				
1.....	4.5	2.7	1.5	1.8
2.....	4.0	2.8	2.1	2.3
3.....	3.4	2.4	1.5	1.5
4.....	4.6	2.6	2.4	1.8
5.....	3.5	2.2	1.6	1.3
6.....	4.2	3.8	2.8	2.5
Average.....	4.0	2.8	2.0	1.9
Late season:				
1.....	5.0	3.2	3.0	2.3
2.....	4.7	3.3	1.9	1.8
3.....	4.0	2.5	3.5	2.6
4.....	5.8	3.0	3.2	2.5
5.....	5.1	2.9	1.7	1.8
6.....	4.6	2.4	2.5	3.1
Average.....	4.9	2.9	2.6	2.4
Average both seasons.....	4.4	2.8	2.3	2.1

Table 17.--Manufacturing waste of cotton by seasons and number of lint cleaners, six sample gins, 1961-62

Season and gin number	Number of lint cleaners			
	None	One	Two	Three
	Percent	Percent	Percent	Percent
Early season:				
1.....	6.9	5.6	5.5	5.7
2.....	7.4	6.0	5.3	5.4
3.....	6.4	5.5	5.5	5.3
4.....	7.0	5.9	5.6	5.4
5.....	6.1	5.4	4.6	4.7
6.....	6.0	5.2	5.2	4.8
Average.....	6.6	5.6	5.3	5.2
Late season:				
1.....	8.8	6.8	6.0	5.9
2.....	7.4	6.2	5.6	5.7
3.....	8.4	6.5	6.6	6.6
4.....	9.1	7.5	7.0	6.6
5.....	7.6	5.8	5.1	5.0
6.....	6.7	6.3	5.5	5.4
Average.....	8.0	6.5	6.0	5.9
Average both seasons.....	7.3	6.1	5.6	5.5

Table 18.--Neps per 100 square inches of cotton card web, by seasons and number of lint cleaners, six sample gins, 1961-62

Season and gin number	Number of lint cleaners			
	None	One	Two	Three
	<u>Number</u>	<u>Number</u>	<u>Number</u>	<u>Number</u>
Early season:				
1.....	14	18	19	28
2.....	17	17	19	28
3.....	16	18	21	26
4.....	28	33	37	36
5.....	15	21	23	27
6.....	17	22	28	28
Average.....	18	22	24	29
Late season:				
1.....	24	25	31	31
2.....	24	24	26	36
3.....	30	39	28	38
4.....	40	48	67	66
5.....	20	21	26	30
6.....	24	36	42	52
Average.....	27	32	37	42
Average both seasons.....	22	27	31	36

### Yarn Appearance

Lint cleaning had no statistically significant effect on yarn appearance grades (table 19). However, the overall average indicates a slight reduction in yarn appearance as the number of lint cleaners was increased. There was a reduction of about one-half grade for early season and less than one-fourth grade for late season cotton associated with three lint cleanings compared with none. The small differences which occurred in this test are to be expected, since yarn appearance grades are determined by three factors--neppiness, trash or imperfections, and unevenness. The increase in neppiness and decrease in trash as lint cleaners were added tended to compensate for each other, with only small differences occurring in the overall yarn appearance grade.

### Strength Index

Breaking strength of yarn is an important factor in textile manufacture. Gin treatment of cotton which would lower yarn strength would increase processing costs and decrease yarn quality.



Table 19.--Appearance grade of cotton yarn, by seasons and number of lint cleaners, six sample gins, 1961-62

Season and gin number	Number of lint cleaners			
	None	One	Two	Three
	<u>Grade</u>	<u>Grade</u>	<u>Grade</u>	<u>Grade</u>
Early season:				
1.....	C+	C+	C	D+
2.....	C	C+	C	D+
3.....	C+	C	C	C
4.....	C	C	C	D+
5.....	C+	C	C	C
6.....	C+	C	C	C
Average index $\frac{1}{2}$ /.....	97	93	90	85
Late season:				
1.....	D+	D+	D+	D+
2.....	D+	C	D+	D+
3.....	C	C	C	C
4.....	BG	D	BG	BG
5.....	C	C	C	C
6.....	C+	C	D+	D+
Average index $\frac{1}{2}$ /.....	83	85	80	80
Average index both seasons.....	90	89	85	82

$\frac{1}{2}$  C+ = 100, C = 90, D+ = 80, D = 70, and BG = 60.

The effects of lint cleaning on the strength of 40s yarn in these tests were neither consistent nor significant (table 20). One lint cleaning had no appreciable effect on yarn strength. The use of two lint cleaners reduced yarn strength and on the average, a further reduction was noted when three cleaners were used. Lots subjected to three lint cleanings produced yarn with an average strength index of 97, compared with 100 for groups ginned without lint cleaning. Even with three lint cleanings, however, some lots produced stronger yarn than the corresponding lots which received no lint cleaning.

Table 20.--Strength index of cotton yarn by seasons and number of lint cleaners, six sample gins, 1961-62 1/

Season and gin number	Number of lint cleaners			
	None	One	Two	Three
	<u>Units</u>	<u>Units</u>	<u>Units</u>	<u>Units</u>
Early season:				
1.....	100	98	95	89
2.....	100	97	96	96
3.....	100	100	96	89
4.....	100	100	103	101
5.....	100	101	102	101
6.....	100	107	103	104
All.....	100	101	99	97
Late season:				
1.....	100	101	97	100
2.....	100	99	100	94
3.....	100	96	99	94
4.....	100	97	94	97
5.....	100	103	101	97
6.....	100	100	100	98
All.....	100	100	99	97
Both seasons.....	100	100	99	97

1/ Break factor for 40s yarn made from cotton subjected to one, two, and three lint cleanings, expressed as a percentage of the break factor for 40s yarn made from cotton with no lint cleaning.

### Spinning Performance

Although lint cleaners were not shown to have a statistically significant effect on spinning performance, there was evidence that excessive lint cleaning increases yarn breakage during spinning (table 21). There was an increase in ends-down for 5 of the 6 lots of early-season cotton ginned with one lint cleaning compared with none, but there was a decrease for 4 of the 6 lots of late-season cotton ginned the same way. All of the 6 early-season lots ginned with two lint cleanings had ends-down counts higher than corresponding lots not lint cleaned, but only 4 were higher than those with one lint cleaning. Of the late-season lots subjected to two lint cleanings, 4 had counts higher than those with no lint cleaning and 5 were higher than those with one lint cleaning. Even with 3 cleanings, 2 of the 12 lots had lower ends-down counts than corresponding lots with fewer stages of lint cleaning.

The overall averages of ends-down indicate that an increase could normally be expected as a result of three lint cleanings. However, the discrepancies in the data and the fact that these effects were not statistically significant indicate that other factors affecting spinning performance were not controlled or measured.

Table 21.--Ends-down index of cotton by seasons and number of lint cleaners, six sample gins, 1961-62 1/

Season and gin number	Number of lint cleaners			
	None	One	Two	Three
	<u>Index</u>	<u>Index</u>	<u>Index</u>	<u>Index</u>
Early season:				
1.....	100	129	152	505
2.....	100	61	106	152
3.....	100	138	175	300
4.....	100	183	108	412
5.....	100	111	107	115
6.....	100	125	357	537
All.....	100	114	177	357
Late season:				
1.....	100	84	132	118
2.....	100	89	107	207
3.....	100	71	85	114
4.....	100	132	140	93
5.....	100	86	69	67
6.....	100	104	115	189
All.....	100	92	109	125
Both seasons.....	100	99	130	200

1/ Ends-down per thousand spinning hours for cotton subjected to one, two, and three lint cleanings, expressed as a percent of ends-down for cotton with no lint cleaning.

#### SOME ECONOMIC IMPLICATIONS OF THE STUDY

The use of lint cleaners in gins, at least up to three stages, improves the grade of machine-harvested cotton, except when the best qualities are being obtained without any lint cleaning, or with only one or two lint cleanings. A ginner could improve or maintain his competitive position by using lint cleaners even when cotton prices are such that weight losses and the costs of providing the service offset, or more than offset, the grade improvements. To the grower, grade of a bale of cotton is tangible evidence of the quality of the ginning service he is receiving, while the net effect of the ginning is not always readily discernible. Also, a ginner's unit cost of production depends to a large extent upon volume of ginning. If he can maintain or increase his volume by providing extra services, such as lint cleaning, his unit costs may be lower than with a lower volume, even though the extra services were not provided.

Results of this study indicate that under any conceivable price situation when cotton is sold on the basis of grade and staple, the bale value of the better grades would not be increased, and could be reduced, by one or more lint cleanings. However, the bale value of some lower or spotted grades would be increased by the action of as many as three stages of lint cleaning. Thus,

if the ginner can be provided with information which will enable him to decide the number of lint cleaners to use profitably under varying conditions of prices and cotton, he will be in a position to render to his patrons the best service possible.

The maximum number of stages of lint cleaning which will give the best result on any of the cotton ginned can be installed in his gin. However, he can operate more economically and render better service by using only the best combination of lint cleaning and seed cotton cleaning for the cotton being ginned at any specific time.

The spinning tests of this study indicate that unwise and excessive lint cleaning of a particular grade of cotton can increase costs of processing in textile mills and can reduce the quality of manufactured products. Either of these outcomes can affect all segments of the domestic cotton industry adversely through further losses of markets for textile products to competing fibers, and through reduced industry capability in competing with foreign-made cotton textile products in both foreign and domestic markets. These effects, in turn, might reduce raw cotton prices. Thus, all segments of the domestic cotton industry and the Federal Government have much to gain from wise and moderate uses of lint cleaners at gins.



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Table 22.--Grades of cotton after one lint cleaner, Midsouth, 1961-62

Grade before lint cleaning	Grade after lint cleaning													
	White							Light Spotted						
	Total	SM	M+	M	SLM+	SIM	LM+	LM	SGO+	SGO	M	SIM	LM	Spotted
Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales
<u>White:</u>														
M.....	12	1		10	1									
SLM+.....	15			12	2		1							
SIM.....	79			32	20	26		1						
LM+.....	63			3	11	35	13			1				
LM.....	186			10	13	85	47	28				3	1	
SGO+.....	14					1	5	7					1	
SGO.....	89				2	18	21	43	2	1		1	1	
GO+.....	1							1						
GO.....	3						1	2						
BG.....	28			1		1		2	1			4	18	1
<u>Light Spotted:</u>														
M.....	13	2	1	9			1					10	7	
SIM.....	31			4	2	8						2	8	1
LM.....	48			2		8	2	7						
<u>Spotted:</u>														
SIM.....	5											2	1	2
LM.....	13											3	2	2
All bales.....	600	3	1	83	51	182	91	91	3	2	14	37	30	5
														7

Table 23.--Grades of cotton after two lint cleaners, Midsouth, 1961-62

Grade before lint cleaning	Grade after lint cleaning													
	White							Light Spotted						
	Total													
		SM	M+	M	SIM+	SIM	IM+	IM	SGO	SM	M	M	SIM	IM
	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales
White:														
M.....	12	6	1	5										
SIM+.....	15	1	2	10			1							
SIM.....	79	2	1	52	12									
IM+.....	63	1		17	18		2							
IM.....	186			44	22		23	6						
SGO+.....	14			1			3	7						1
SGO.....	89			8	14		16	14	1					
GO+.....	1							1						
GO.....	3						1	2						
BG.....	28							7	1	2			15	1
Light Spotted:														
M.....	13	7		5								1		
SIM.....	31			9						2		11	2	
IM.....	48			4				2			2	9	10	
Spotted:														
SIM.....	5												3	
IM.....	13									2		2	11	
All bales.....	600	17	4	155	66	197	46	39	2	4	4	23	42	1



Table 24.--Grades of cotton after three lint cleaners, Midsouth, 1961-62

Grade before lint cleaning	Grade after lint cleaning											
	Total			White			Light Gray			Light Spotted		
	SM	M+	M	SIM+	SIM	LM+	IM	SM	M	M	SIM	
Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales
<u>White:</u>												
M.....	12	9		3								
SIM+.....	15	4		11								
SIM.....	79	8	1	60	7				1			
LM+.....	63	1	1	31	19	1						
LM.....	186		1	70	91	6						
SGO+.....	14			2	5	5					1	
SGO.....	89			13	39	9					3	
GO+.....	1				1							
GO.....	3				1			2				
BG.....	28			1	6			2	3	2	14	
<u>Light Spotted:</u>												
M.....	13	9		4								
SIM.....	31	2		13	11				2	3		
IM.....	48			4	27					1	9	7
<u>Spotted:</u>												
SIM.....	5									5		
IM.....	13				1					4	8	
All bales.....	600	33	3	213	43	21	16	3	4	23	33	

Table 25.--Grades of cotton after one lint cleaner, West Texas, 1961-62

Grade before lint cleaning	Grade after lint cleaning													
	Total	White										Light Spotted		
		SM	M+	M	SLM+	SLM	IM+	IM	SM	M	SLM	IM		
Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	
White:														
M+.....	1											1		
M.....	98	49		46	1							2		
SLM+.....	5			2	2	1								
SLM.....	57	5		37	5	5						5		
IM+.....	8			3	3	1						1		
IM.....	36					16	2	2				9	7	
SGO+.....	1					1								
BG.....	1												1	
Light Spotted:														
SM.....	38	13	1	8								16		
M.....	215	7		100	1	1						37	69	
SLM.....	113	1		5	4	12						4	58	29
IM.....	27					5	3						2	16
All bales.....														
	600	75	1	201	15	43	5	2		60	144	53		1

Table 26.--Grades of cotton after two lint cleaners, West Texas, 1961-62

Grade before lint cleaning	Total	Grade after lint cleaning									
		White					Light Spotted				
		SM	M	SLM+	SLM	LM+	SM	M	SLM	Bales	Bales
White:	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales
M+.....	1	1									
M.....	98	84	14								
SLM+.....	5		5								
SLM.....	57	12	43		1		1				
LM+.....	8		6	2							
LM.....	36		4		17	1		6			8
SGO+.....	1		1								
BG.....	1										1
<u>Light Spotted:</u>											
SM.....	38	32	2				4				
M.....	215	65	130				15	5			
SLM.....	113	1	28	1	13		6	61	3		
LM.....	27				1	1	1	18	6		
All bales.....	600	195	233	3	32	2	27	90	18		

Table 27.--Grades of cotton after three lint cleaners, West Texas, 1961-62

Grade before lint cleaning	Grade after lint cleaning									
	Total		White		Light Spotted					
	SM	M	SM	M	SM	M	SM	M	SM	SIM
White:	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales
M+	1	1								
M	98	90	8							
SIM+	5		5							
SIM	57	9	47		1					
IM+	8		8							
IM	36		8		24		1		2	1
SGO+	1		1							
BG	1				1					
<u>Light Spotted:</u>										
SM	38	33	1				4			
M	215	89	121				5			
SIM	113	9	55		7		4		38	
IM	27		2		7		1		15	2
All bales	600	231	256		40		15		55	3



Table 28.--Grades of cotton after one lint cleaner, California, 1961-62

Grade before lint cleaning	Total	Grade after lint cleaning											
		White											
		SM	M+	M	SIM+	SIM	IM+	LM	SGO	SM	M	SIM	Light Gray
Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales
White:													
M.....	27	3	1	23									
SIM+.....	13			11	2								
SIM.....	254			176	17	59		1				1	
LM+.....	21			1	4	16							
LM.....	210			27	12	130	11	25				2	1
SGO+.....	1						1						
SGO.....	58					19	17	19	3				
GO.....	15						6	4	5				
Light Spotted:													
LM.....	1						1						
All bales.....	600	3	1	238	35	224	36	49	8	3	2	1	

Table 29.--Grades of cotton after two lint cleaners, California, 1961-62

Grade before lint cleaning	Total	Grade after lint cleaning											
		White											
		SM	M+	M	SIM+	SIM	IM+	LM	SGO	SM	M	SIM	Light Gray
Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales
White:													
M.....	27	13	1	13									
SIM+.....	13	2	1	9	1							5	
SIM.....	254	35	7	193	4	10						1	
LM+.....	21			11	3	6						18	5
LM.....	210			87	8	88	1	3					
SGO+.....	1												
SGO.....	58			1			7	12				3	2
GO.....	15						3	5	1				
Light Spotted:													
LM.....	1												
All bales.....	600	50	9	314	16	145	11	20	1	27	7		

Table 30.--Grades of cotton after three lint cleaners, California, 1961-6

Grade before lint cleaning	Grade after lint cleaning										
	White										Light Gray
	Total	SM	M+	M	SLM+	SLM	LM+	LM	SM	M	
	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales
<u>White:</u>											
M.....	27	25		2							
SLM+.....	13	10		3							
SLM.....	254	133		105		7				9	
LM+.....	21			20						1	
LM.....	210	27	1	96	4	47		1		34	
SGO+.....	1					1					
SGO.....	58			5	4	35		5		5	4
GO.....	15					9	2	4			
<u>Light Spotted:</u>											
LM.....	1					1					
All bales.....	600	195	1	231	8	100	2	10	49		4

Table 31.--Cotton prices, 14-market average 1957-58

Grade	Staple length						
	30	31	32	33	34	35	36
	Cents	Cents	Cents	Cents	Cents	Cents	Cents
<u>White</u>							
SM.....	33.56	34.27	35.21	36.14	37.15	38.06	38.63
M+.....	33.24	33.94	34.80	35.70	36.64	37.52	38.10
M.....	32.93	33.62	34.39	35.26	36.12	36.97	37.58
SLM+.....	30.96	31.66	32.46	33.26	33.95	34.92	35.40
SLM.....	29.00	29.70	30.52	31.27	31.78	32.86	33.22
LM+.....	27.22	27.88	28.56	29.20	29.62	30.42	30.66
LM.....	25.44	26.05	26.60	27.13	27.47	27.98	28.11
SGO+.....	23.92	24.51	25.03	25.46	25.69	26.14	26.21
SGO.....	22.41	22.97	23.46	23.79	23.91	24.31	24.31
GO+.....	21.20	21.71	22.16	22.44	22.54	22.90	22.90
GO.....	19.99	20.45	20.87	21.09	21.18	21.50	21.50
BG.. ..	17.57	17.93	18.28	18.39	18.45	18.69	18.69
<u>Light Spotted</u>							
SM.....	31.00	31.66	32.50	33.25	33.96	34.72	35.22
M.....	29.20	29.92	30.70	31.42	31.99	32.89	33.37
SLM.....	25.74	26.38	27.12	27.62	27.96	28.76	28.94
LM.....	22.62	23.13	23.63	24.00	24.24	24.84	24.91
<u>Spotted</u>							
SLM.....	22.49	23.05	23.73	23.97	24.13	24.66	24.67
LM.....	19.79	20.21	20.66	20.88	21.00	21.69	21.71
<u>Light Gray</u>							
SM.....	30.82	31.42	32.23	32.97	33.68	34.51	34.90
M.....	29.12	29.74	30.48	31.17	31.76	32.58	32.98

Table 32.--Cotton prices, 14-market average, November 1961

Grade	Staple length						
	30	31	32	33	34	35	36
	Cents	Cents	Cents	Cents	Cents	Cents	Cents
<u>White</u>							
SM.....	32.80	33.43	34.13	34.88	35.50	35.87	36.80
M+.....	32.53	33.13	33.82	34.56	35.24	35.60	36.32
M.....	32.35	32.93	33.59	34.35	34.93	35.31	35.88
SLM+.....	31.70	32.25	32.83	33.45	34.03	34.29	34.86
SLM.....	31.28	31.73	32.31	32.85	33.34	33.64	34.25
LM+.....	30.63	31.07	31.53	31.94	32.18	32.29	32.81
LM.....	30.19	30.64	31.08	31.46	31.71	31.82	32.38
SGO+.....	29.41	29.80	30.27	30.55	30.67	30.69	30.98
SGO.....	28.95	29.31	29.74	30.01	30.12	30.14	30.43
GO+.....	28.12	28.41	28.81	29.04	29.12	29.14	29.46
GO.....	27.67	27.96	28.31	28.54	28.61	28.62	28.87
BG.. ..	26.41	26.61	26.88	27.07	27.10	27.10	27.31
<u>Light Spotted</u>							
SM.....	31.98	32.45	33.01	33.66	34.11	34.40	34.79
M.....	31.43	31.83	32.37	32.82	33.31	33.60	34.02
SLM.....	30.49	30.90	31.30	31.66	31.92	32.02	32.48
LM.....	29.24	29.65	30.02	30.30	30.46	30.51	30.87
<u>Spotted</u>							
SLM.....	29.13	29.48	29.74	29.97	30.10	30.14	30.30
LM.....	27.97	28.28	28.54	28.76	28.83	28.84	28.84
<u>Light Gray</u>							
SM.....	31.44	31.92	32.42	32.90	33.35	33.60	34.30
M.....	30.52	30.93	31.41	31.79	32.11	32.28	33.12

Table 33.--Foreign matter and moisture in 48 spinning lots of cotton by gins, seasons, and number of lint cleaners, 1961

Test item	Season and number of lint cleaners used							
	Early				Late			
	None	One	Two	Three	None	One	Two	Three
	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
<u>Gin No. 1:</u>								
<u>Seed cotton</u>								
Foreign matter:								
Wagon sample.....	4.7	4.2	5.8	6.6	--	--	--	--
Feeder sample....	1.2	1.2	1.2	1.1	--	--	--	--
Moisture:								
Wagon sample.....	8.8	8.4	11.0	10.3	8.9	9.0	8.8	9.0
Feeder sample....	6.8	7.0	7.1	8.0	8.1	7.5	7.8	8.1
<u>Lint cotton</u>								
Moisture.....	4.0	3.7	2.9	3.3	7.3	6.9	6.9	7.1
<u>Gin No. 2:</u>								
<u>Seed cotton</u>								
Foreign matter:								
Wagon sample.....	5.4	3.3	3.2	4.1	4.0	5.4	5.3	5.7
Feeder sample....	1.6	1.5	2.0	1.4	1.3	2.1	1.4	1.7
Moisture:								
Wagon sample.....	14.6	10.8	10.8	13.9	8.9	10.0	9.0	9.7
Feeder sample....	10.2	9.8	8.6	10.5	8.0	7.7	8.1	7.6
<u>Lint cotton</u>								
Moisture.....	7.4	6.6	6.0	6.0	5.6	4.9	5.5	4.8
<u>Gin No. 3:</u>								
<u>Seed cotton</u>								
Foreign matter:								
Wagon sample.....	26.2	25.8	25.7	26.5	30.0	28.6	27.8	27.1
Feeder sample....	0.7	0.8	0.5	0.5	2.2	3.0	3.0	3.8
Moisture:								
Wagon sample.....	9.9	10.7	10.0	9.0	11.5	10.2	11.6	11.2
Feeder sample....	9.3	9.6	9.0	8.2	7.6	12.3	9.6	8.6
<u>Lint cotton</u>								
Moisture.....	5.9	5.8	5.6	4.7	5.7	5.2	5.6	5.0

--Continued



Table 33.--Foreign matter and moisture in 48 spinning lots of cotton by gins, seasons, and number of lint cleaners, 1961--Continued

Test item	Season and number of lint cleaners used							
	Early				Late			
	None	One	Two	Three	None	One	Two	Three
	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
<u>Gin No. 4:</u>								
<u>Seed cotton</u>								
Foreign matter:								
Wagon sample.....	27.8	28.3	26.9	26.6	31.3	31.1	32.0	33.0
Feeder sample.....	0.7	0.7	0.9	1.0	1.5	1.5	1.6	1.9
Moisture:								
Wagon sample.....	9.0	7.6	8.2	7.6	7.3	6.7	8.5	6.6
Feeder sample.....	7.7	7.3	7.5	7.1	5.9	6.9	6.3	7.3
<u>Lint cotton</u>								
Moisture.....	7.7	7.1	7.1	6.8	4.0	4.6	4.2	4.3
<u>Gin No. 5:</u>								
<u>Seed cotton</u>								
Foreign matter:								
Wagon sample.....	4.1	5.0	4.4	2.6	10.6	10.3	9.3	8.7
Feeder sample.....	0.7	0.7	0.6	0.7	1.4	1.1	0.8	1.7
Moisture:								
Wagon sample.....	4.8	5.8	5.6	5.8	6.8	7.4	7.9	8.1
Feeder sample.....	5.7	5.2	5.7	5.5	6.7	6.3	6.7	8.9
<u>Lint cotton</u>								
Moisture.....	3.8	3.2	3.8	3.8	5.0	5.5	5.1	5.4
<u>Gin No. 6:</u>								
<u>Seed cotton</u>								
Foreign matter:								
Wagon sample.....	4.7	5.4	5.0	0.2	0.2	4.5	3.1	4.4
Feeder sample.....	1.2	1.0	1.1	1.3	1.3	1.0	1.4	1.2
Moisture:								
Wagon sample.....	7.6	7.7	7.8	8.3	7.5	7.5	7.2	8.5
Feeder sample.....	5.6	5.1	6.1	6.4	6.5	7.0	7.1	6.4
<u>Lint cotton</u>								
Moisture.....	3.4	3.6	3.4	3.7	4.4	4.4	4.6	4.8

Table 34.--Micronaire fineness of cotton by seasons and number of lint cleaners, six sample gins, 1961-62

Season and gin number	Number of lint cleaners			
	None	One	Two	Three
	Units	Units	Units	Units
Early season:				
1.....	4.4	4.5	4.5	4.4
2.....	4.4	4.4	4.3	4.4
3.....	4.4	4.4	4.4	4.4
4.....	3.8	3.8	3.4	3.5
5.....	4.3	4.2	4.4	4.4
6.....	4.0	4.0	3.9	4.0
Average.....	4.2	4.2	4.2	4.2
Late season:				
1.....	4.0	4.0	4.0	4.0
2.....	3.8	3.7	3.8	3.6
3.....	3.5	3.6	3.6	3.6
4.....	4.0	4.1	3.2	3.3
5.....	4.4	4.2	4.0	4.1
6.....	3.2	3.2	3.3	3.2
Average.....	3.8	3.8	3.6	3.6
Average both seasons.....	4.0	4.0	3.9	3.9

Table 35.--Strength of cotton fiber (100 lb./sq. in., "0" gauge Pressley) by seasons and number of lint cleaners, six sample gins, 1961-62

Season and gin number	Number of lint cleaners			
	None	One	Two	Three
	1,000 lb.	1,000 lb.	1,000 lb.	1,000 lb.
Early season:				
1.....	81	79	78	78
2.....	80	78	76	79
3.....	73	74	72	75
4.....	68	66	64	64
5.....	95	95	94	92
6.....	91	90	93	93
Average.....	81	80	80	80
Late season:				
1.....	78	77	78	78
2.....	78	78	78	78
3.....	70	70	70	73
4.....	64	66	66	64
5.....	92	90	90	88
6.....	94	90	94	96
Average.....	79	78	79	80
Average both seasons.....	80	79	79	80

Table 36.--Strength of cotton fiber (grams/tex, "1/8" gauge Pressley) by seasons and number of lint cleaners, six sample gins, 1961-62

Season and gin number	Number of lint cleaners			
	None	One	Two	Three
	<u>Grams/tex</u>	<u>Grams/tex</u>	<u>Grams/tex</u>	<u>Grams/tex</u>
Early season:				
1.....	23.9	23.0	22.8	22.6
2.....	23.9	23.6	24.1	23.6
3.....	20.6	20.2	19.8	20.5
4.....	19.3	19.4	19.6	19.0
5.....	27.0	26.8	26.8	26.0
6.....	25.9	25.8	27.2	26.6
Average.....	23.4	23.1	23.4	23.0
Late season:				
1.....	22.1	22.2	22.6	22.3
2.....	22.6	23.1	23.7	23.6
3.....	19.8	18.8	19.2	19.0
4.....	18.4	17.8	19.4	18.8
5.....	26.4	26.2	27.2	26.2
6.....	27.0	27.0	27.4	27.2
Average.....	22.7	22.5	23.2	22.8
Average both seasons.....	23.1	22.8	23.3	23.0

Table 37.--Upper half mean length of cotton fiber (fibrograph) by season and number of lint cleaners, six sample gins, 1961-62

Season and gin number	Number of lint cleaners			
	None	One	Two	Three
	<u>Inches</u>	<u>Inches</u>	<u>Inches</u>	<u>Inches</u>
Early season:				
1.....	1.14	1.12	1.11	1.07
2.....	1.14	1.16	1.14	1.15
3.....	.98	.98	.96	.95
4.....	.95	.96	.96	.95
5.....	1.08	1.08	1.10	1.07
6.....	1.10	1.10	1.08	1.06
Average.....	1.06	1.07	1.06	1.04
Late season:				
1.....	1.08	1.08	1.06	1.07
2.....	1.10	1.10	1.08	1.05
3.....	.90	.90	.90	.89
4.....	.92	.90	.91	.89
5.....	1.10	1.10	1.09	1.10
6.....	1.06	1.05	1.06	1.05
Average.....	1.03	1.02	1.02	1.01
Average both seasons.....	1.04	1.04	1.04	1.02

Table 38.--Mean length of cotton fiber (fibrograph) by season and number of lint cleaners, six sample gins, 1961-62

Season and gin number	Number of lint cleaners			
	None	One	Two	Three
	<u>Inches</u>	<u>Inches</u>	<u>Inches</u>	<u>Inches</u>
Early season:				
1.....	0.92	0.90	0.88	0.82
2.....	.94	.96	.94	.93
3.....	.80	.78	.77	.76
4.....	.76	.78	.78	.77
5.....	.91	.90	.91	.89
6.....	.93	.90	.88	.84
Average.....	.88	.87	.86	.84
Late season:				
1.....	.85	.86	.84	.82
2.....	.85	.84	.84	.80
3.....	.72	.72	.72	.70
4.....	.72	.69	.70	.69
5.....	.90	.91	.90	.92
6.....	.86	.86	.86	.84
Average.....	.82	.81	.81	.80
Average both seasons.....	.85	.84	.84	.82

Table 39.--Uniformity ratio of length of cotton fiber (fibrograph) by season and number of lint cleaners, six sample gins, 1961-62

Season and gin number	Number of lint cleaners			
	None	One	Two	Three
	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Early season:				
1.....	81	80	80	77
2.....	82	82	82	81
3.....	82	80	80	80
4.....	80	82	80	81
5.....	84	82	84	83
6.....	85	82	81	80
Average.....	82	81	81	80
Late season:				
1.....	79	78	78	77
2.....	77	76	78	76
3.....	80	80	80	80
4.....	78	77	78	78
5.....	82	83	83	84
6.....	82	82	82	80
Average.....	80	79	80	79
Average both seasons.....	81	80	80	80



Table 40.--Processing organization of cotton used in multiple lint cleaning study, 1961

Equipment	Size and product	Twist multiplier	Spindle speed (r.p.m.)
Opening and picking.....	14 oz. lap	--	--
Carding (9-1/2 lb./hr.).....	50 Gr. sliver	--	--
Drawing - 2 process:			
Breaker.....	53 Gr. sliver	--	--
Finisher.....	55 Gr. sliver	--	--
Roving.....	1.25 HK. roving	1.30	
Spinning:			
Gin No. 1:			
Early.....	40s yarn	3.32	11,000
Late.....	40s yarn	3.32	11,000
Gin No. 2:			
Early.....	40s yarn	3.32	12,000
Late.....	40s yarn	3.39	11,000
Gin No. 3:			
Early.....	40s yarn	3.79	11,000
Late.....	40s yarn	3.79	11,000
Gin No. 4:			
Early.....	40s yarn	3.89	10,000
Late.....	40s yarn	4.56	11,000
Gin No. 5:			
Early.....	40s yarn	3.25	11,000
Late.....	40s yarn	3.25	11,000
Gin No. 6:			
Early.....	40s yarn	3.12	12,000
Late.....	40s yarn	3.25	12,000











